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TROPICAL SURGERY
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DISEASES OF THE FAR EAST

TROPICAL SURGERY

AND

DISEASES OF THE FAR EAST

INCLUDING ANSWERS TO A QUESTIONNAIRE

BY

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Approved for Publication by the Surgeon General of the United States Army

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DEDICATED TO MY DEAR FRIEND, DOCTOR ARISTON BAUTISTA Y LIM OF MANILA, PROFESSOR OF CLINICAL MEDICINE IN THE COLLEGE OF MEDICINE AND SURGERY, UNIVERSITY OF THE PHILIPPINES, IN APPRECIATION OF HIS TRUE FRIENDSHIP AND OF HIS UNSELFISH DEVOTION TO THE ADVANCEMENT OF HIS PEOPLE.

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FOREWORD

The winning of the world war demands the assembling of all knowledge which may be of possible use. Surgical as well as medical diseases of the Tropics are already encountered in all armies, not only during their tropical service, but in that in Europe and America as well. The author having noted this fact during overseas service in 1916-1917 has put together material which he has been collecting for years and has added abstracts of recent literature in the hope that such a compilation may be of some value during and after the war.

Opportunities for observation were found in a practically continuous life of fourteen years in the Tropics; in our South, Cuba, the Philippines, and in frequent visits to China and Japan. Four years of this time were served as a volunteer surgeon in the United States Army, as chief operating surgeon to an army corps in the field in Cuba, in Luzon with troops in the field, and in base hospitals in Manila as operating surgeon. Ten years were spent in private and public practice in Manila during which many medical institutions were organized. The clinical data in Part I are mostly from the last five thousand carefully recorded surgical cases among Filipinos. The material of Part II was derived from travel and personal contact with many of the medical men in China, Japan, Indo China, and the Straits Settlements, as well as from answers to a questionnaire sent to over two thousand medical men in the Tropics. The ground covered in Part II includes the Philippines, Japan, China, Indo China, Ceylon, Straits Settlements, Guam, Samoa, Burma, India, and parts of Africa in all of which countries

the allied troops are already in the field. The medical men who contributed data are prominent in their fields, many have been living in Far Eastern countries the best part of their lives and are still there. The best reports were from United States Army Surgeons Chamberlain, Phalen, Vedder, Nichols, and Page and from surgeons of the United States Navy, especially Surgeons Cottle and Odell. The reports and published works of the surgeons in the Anglo-Indian medical service, which were kindly furnished by the Honorable Surgeon-General C. P. Lukis, of Calcutta, were splendid and contained important original work by such men as Sir Havelock Charles, Major Leonard Rogers, Sir Ronald Ross, and Austin Smith of Agra. Of great general interest are the descriptions by the medical missionaries, especially in China, among whom were Snell of Soochow, Plummer of Wenchau, and Margaret E. Philipps of Ping Yin; Ralph G. Mills of Seoul, Korea, and sixteen colleagues, practicing in Korea for an average of ten years each, made the questionnaire the subject of a symposium. Landsborough of Formosa, Turner of South Africa, Hollenbeck of West Africa, Castellani, de Silva and Faul of Ceylon, Castor of Burma, and many others have made valuable contributions both to literature and in personal communications concerning tropical medicine and surgery.

This information and my own experience bear out the truth that the broad principles of epidemiology, prophylaxis, pathology, and therapeutics are equally applicable everywhere, and that there is no foundation for the idea that diseases met with in other countries can be classed as special in type or differing, except in pathologic range, from the diseases of our own and European countries, although the anomalies and curiosities of a foreign medical experience have their interesting features. When the important diseases known as "tropical," which are

now being discovered everywhere, appear, the question of their origin is invariably answered by pointing to the constantly improving means of communication around the world and to the fact that diseases always follow the paths of commerce and the march of armies.

J. R. M.

June, 1918.

CONTENTS

PART I

THE CONDITIONS SUPPOSED TO MODIFY SURGICAL PROCEDURE IN THE TROPICS, SURGICAL DISEASES RARELY SEEN ELSEWHERE, ALSO THOSE SEEN MOSTLY IN EQUATORIAL LANDS BUT TRANSPORTABLE TO OTHER COUNTRIES AND LIKELY TO COME WITHIN THE EXPERIENCE OF ANY MEDICAL MAN.

CHAPTER I

INTRODUCTION

Introduction, 17.

CHAPTER II

SURGERY AND SURGICAL OPERATIONS

Surgery and Surgical Operations, 22.

CHAPTER III

DISEASES OF THE HEAD, NECK AND THORAX

The Head and Neck, 25; Congenital Defects and Anomalies, 25; Injuries and Results of Injuries and Disease, 25; Cysts, Fistulas and Torticollis of Neck, Rare, 25; Ludwig's Angina, 25; Tuberculosis and Hodgkin's Disease, etc., Neck, 26; Cancer, Cysts, and Osteomyelitis, 27; The Thorax, 29; Bronchomycosis and Bronchomoniliasis, 30.

CHAPTER IV

THE ABDOMEN

The Abdomen, 33; Hernia, 33; The Spleen, 34; Splenic Anemia and the Kala-azar, 34; The Colon, 37; Entamebic Dysentery, 37; History, Walker and Sellards, 37; Diagnosis, Treatment, and Prophylaxis, 39; Balantidial Dysentery, 63; Bacillary Dysentery, 66; General Intestinal Parasitism, 67; Influence on Surgical Prognosis, 67; Relation to Typhoid Hemorrhages, 68; The Liver, 69; Entamebic Abscess, 69.

CHAPTER V

GYNECOLOGY AND OBSTETRICS

Gynecology and Obstetrics, 86; Pelvic Inflammatory Diseases, 86; Obstetric Customs, 86; Tumors, 89.

CHAPTER VI

GENITOURINARY

Genitourinary, 90; Tropical Fistulæ in Ano, 90.

CHAPTER VII

CATASTROPHE AND EMERGENCY SURGERY

Catastrophe and Emergency Surgery, 92; Volcano Eruption Burns, 92; Jelly Fish Poisoning, 92; Snakes and Wild Beasts, 93.

CHAPTER VIII

FILARIASIS

Filariasis, 95; Elephantiasis, 99; Chylous Ascites, Chylothorax, and Chylocele, 104; Lymph Varix and Lymph Varicose Glands, 110; Hematochyluria, 111; Bilharzia Hematobia, 111; Dracunculus Medinensis, Dracontiasis, Guinea Worm, or the Worm of Pharaoh, etc., 113; Filaria Loa or "Calabar Swellings," 114.

CHAPTER IX

SURGICAL INFECTIONS

A Fourth Stage of Syphilis (Gangosa, Yaws, and Chronic Ulcerations), 116; Gangosa, 116; Frambesia, or Yaws, 125; Chronic Ulcerations, 130; Leprosy, 134; The Surgery of Leprosy, 140; Surgical Tuberculosis, 143; Diseases of the Skin, 144; Tropical Dermatomycosis, 145; Mycetoma, or "Madura Foot," 149; Ainhum and Chiggers, 150; The Chigger, Sarcopsylla Penetrans, Ewundu, or Sand Flea, 151; Goundou, or Anakhre, 152; Buboes, 154; Tetanus, 155; Pyogenic Infections, 155; The Arthritides, 158.

PART II

OBSERVATIONS ON CHINA, JAPAN, AND THE PHILIPPINES, AND COLLATED ANSWERS TO A QUESTIONNAIRE OF FIFTY-THREE INQUIRIES SENT TO COUNTRIES IN AND ABOUT THE TROPIC ZONE IN 1911.

CHAPTER X

OBSERVATIONS ON CHINA, JAPAN, AND THE PHILIPPINES

China, 161; Medicine as Practiced by the Chinese, 165; Japan, 172; The Surgery of Japan, 173; The Philippines, 174; A Medical Survey of a Typical Filipino Country Town of 6000 Inhabitants, 178.

CHAPTER XI

ANSWERS TO A QUESTIONNAIRE OF FIFTY-THREE INQUIRIES SENT TO COUNTRIES IN AND ABOUT THE TROPIC ZONE

Answers to a Questionnaire of Fifty-three Inquiries Sent to Countries In and About the Tropic Zone, 183; Races, Physical Conditions, Food and Habits, 184; General Resistance of Patients to Surgical Measures—Shock—Anesthetic Used—Infection of Operation Wounds—Percentage of Aseptic Results in Clean Cases, 190; The Most Common and Frequent Surgical Diseases, 193; Climate: Influence on Foreigners and on Natives, 193; Europeans: Habits, Exercise, Periods of Service, Prevalence Among Them of Diseases of Hot Regions, 195; Wounds: Infections, Pathogenic Causes, by Streptococcus, by Staphylococcus, by Tetanus, etc., Native Treatment of Wounds, 198; The Most Common and Frequent Diseases, 203; Malaria, 204; Malaria: Prevalence as Shown by Blood Examinations; Fever Due to Malaria Following Operations, 205; Prevalence of Opium or Other Drug Habits and Alcoholism, 206; Surgical Tuberculosis: Pulmonary, of Bones, Joints, Tendons, Peritoneum, Skin, Genitourinary Organs and Intestines; Frequency of Pott's Disease; Public Anti-tuberculosis Measures, 208; Kala-azar, 210; Syphilis: Results with Ehrlich's "606" Treatment, 211; Typhoid: Complications, Percentage of Perforations, Peritonitis, Osteomyelitis, Parotitis, Operations Made, 212; Dysentery: Amebic, Bacillary, Perforation of Intestine, Peritonitis; Hemorrhage from the Bowel; Appendicitis: Operations for, Results: Appendicostomy: Is Dysentery Becoming Less Frequent and Less Serious Under Modern Conditions? Relative Percentage Among Natives and Europeans, 213; Intestinal Parasites and Intestinal Worms: Have Systematic Examinations of the Stools of the Natives in Large Numbers and in Different Places in the Country Been Made? 216; "Tropical Liver" and Liver Abscess, 219; Cancer, 222; Diseases of Women Among Natives: Ovarian and Uterine Tumors; Puerperal Injuries; Native Method of Accouchement, 224; Genitourinary Diseases Among Men, 227; Appendicitis: Rule for and Method of Operating; Treatment of General Peritonitis, 229; Gastric Symptoms Caused by Gallstones, Ulcer, Appendicitis, and Cancer, 230; Leprosy: Leper Colonies and Segregation; Surgery for Leprosy, 231; Yaws, 232; Tropical Ulcers and Granulomas of Skin, 233; Filariasis, 234; Ainhum and Goundou, 235; Tumors: Benign and Malignant, 235; Urinary Calculi; Hodgkin's Disease, 236; Diabetes, 236; Paralysis Agitans, 237; Infantile Paralysis, 237; Hernia, 237; Tropical Abscess, 238; Congenital Defects, 238; Varicose Veins, 239; Hemorrhoids and Fistula, 239; Actinomycosis, Glanders, Echinococcus, 240; Tonsils and Adenoids in Children, 241; Infectious Diseases of Children, 242; Ludwig's Angina, 244; Elephantiasis, 244; Skin Diseases, 245; Trichophyton Skin Infections—"Prickly Heat," 247; Furunculosis, 248; Pemphigus Contagiosum, 249; Lesions of Lower Extremities in Barefoot Natives, 249; Gangosa, 250; A Comparison of Certain Diseases Among Natives and in the Observer's Homeland, 252.

APPENDIX

Surgery of the Spleen, 257-296.

ILLUSTRATIONS

FIG.		PAGE
1.	Encephalocystocele	26
2.	Enormous goiter with colloid and fatty degeneration	27
3.	Cancer of the mouth and extension to the neck in a betel nut chewer	28
4.	Cancer of the cheek and face from primary cancer of buccal mucosa in a betel nut chewer	29
5.	Multiple areas of necrosis in acute entamebiasis	38
6.	Multiple ulcerations severe chronic entamebiasis	39
7.	Typical examples of Ameba and Entameba	47
8.	Colon of a man dead from Balantidium coli infection	63
9.	Section of large intestine of monkey, showing three Balantidium coli suis in the deeper part of the mucosa	64
10.	Section of a mesenteric lymph gland of monkey, showing several Balantidium coli hominis in the edge of the glandular tissue	65
11.	Section of large intestine of a man dead from Balantidial dysentery	66
12.	Liver. Upper surface showing minute multiple foci of secondary infection from entamebiasis of the colon	70
13.	Liver. Cut surface of same specimen as Fig. 12	70
14.	Liver. Section of right lobe with large multiple abscesses	71
15.	Liver. Solitary superficial entamebic abscess on outer surface of right lobe	72
16.	Curvilinear incision to expose 9th and 10th ribs	72
17.	Resection of four inches of 10th rib; resulting gutter to be closed immediately by catgut suture	73
18.	Cavity or gutter left by rib resection, partly sutured	73
19.	While incision into the peritoneal cavity is being made the mobilized chest wall is held firmly against the diaphragm by two fingers of an assistant	74
20.	Edges of chest wall and diaphragm, which are to be united by suture, held apart	75
21.	Suture of chest wall and diaphragm completed, showing exposure of liver	76
22.	Mikulicz pack to procure adhesions after failure to find an abscess	77

FIG. PAGE

23. Drain in place, gauze ring around tube to prevent soiling of peritoneum and to form adhesions 78
24. Diagrammatic sketch showing layers incised and digital method of temporarily preventing pneumothorax till diaphragm and chest wall are sutured 79
25. Combination drain and hemostat for liver abscess 81
26. Combination drain and hemostat inflated in a liver abscess specimen 82
27. Liver. Roundworm invasion through large common duct, showing small abscesses 83
28. Liver. Roundworm invasion through large common duct, showing small abscesses 84
29. Ovarian cysts 87
30. A six months' abdominal lithopedion, carried seven years . . . 88
31. Filaria nocturna 96
32. Head end of Filaria nocturna 96
33. Filaria nocturna 97
34. Beginning elephantiasis in an American in Manila 100
35. Chronic elephantiasis nostras streptogenes of scrotum and leg . 101
36. Neurofibromatosis resembling elephantiasis 102
37. Silk covered with membrane at angle with parietal peritoneum shows ectropion 109
38. Instruments for inserting silk in peritoneal cavity 109
39. Silk for insertion in peritoneal cavity 109
40. Gangosa cases in Guam with nasopharyngeal involvement . . . 118
41. Group of gangosa cases in Guam 119
42. Group of gangosa cases showing marked disfigurement following nasopharyngeal lesions 120
43. Gangosa lesions 121
44. Extensive gangosa mutilation in a Filipina 122
45. Gangosa 123
46. Yaws in Samoa 126
47. Yaws 127
48. Yaws 128
49. Gristly healing of tropical phagedenic ulceration 131
50. Syphilitic ulcerations in Filipino 132
51. "Tropical ulceration." Bone exposed 133
52. Early nodular leprosy 134
53. Advanced nodular leprosy 135

FIG. PAGE

54. Pure nerve leprosy 136
55. Nerve leprosy. Infiltration of hand 137
56. Nerve leprosy. Plantar pedis ulcer 138
57. Macular leprosy 139
58. Madura foot 149
59. Ainhum 151
60. Female pregnant chigger 152
61. Male chigger 152
62. Goundou and leontiasis 153
63. Pyogenic infection of hand 156
64. Pyogenic infection picture taken at a time when gangrene of the forefinger had set in 157
65. Symmetrical fibromata 180
66. Symmetrical fibromata on forearms and ankles 181
67. "Fuente," showing ball of wax in ulcer for permanent counter-irritation against all diseases 182
68. The Bevan incision for splenectomy, method of using gauze pack for temporary hemostasis 291
69. Closure of splenic space by snaking catgut suture 295

TROPICAL SURGERY AND DISEASES OF THE FAR EAST

PART I

THE CONDITIONS SUPPOSED TO MODIFY SURGICAL PROCEDURE IN THE TROPICS, SURGICAL DISEASES RARELY SEEN ELSEWHERE, AND THOSE SEEN MOSTLY IN EQUATORIAL LANDS BUT TRANSPORTABLE TO OTHER COUNTRIES AND LIKELY TO COME WITHIN THE EXPERIENCE OF ANY MEDICAL MAN.

CHAPTER I

INTRODUCTION

The sixty degrees of latitude of the earth's surface in the torrid and subtorrid zones, embracing forty-seven countries with a billion people, are the future treasure houses of the world, and it is the Western medical man who will make possible the evolution of these undeveloped but no longer far-off or mysterious lands by converting their waste places into suitable habitations, not only for their own populations, but also for the exotic human transplant who will be necessary for the initiation of the change.

The white man's dread of tropical disease and tropical sunlight has been proved unfounded. After a few slight physiologic irregularities, which soon adjust themselves, he has little to fear from so-called tropical diseases, which are all infections, are usually avoidable, and

whose treatment is now so well understood that the death rate of the white races in well-ordered tropical colonies is as low as in our best regulated cities in Europe or America.

Knowledge of the diseases of other parts of the world is as important to medical men, especially to medical officers of our armies, as is information concerning their commercial needs and resources to the business world because all are being brought ever nearer together by the world war and by constantly improving methods of communication. It was not so very long ago that the development of a few cases of a dreaded epidemic disease, brought from some far off pestilential spot, struck terror from the coast to the interior and paralyzed our commerce to the extent of millions of dollars. The former panics, the blind and costly errors hastily made for protection, are unheard of now because scientific medicine has discovered the methods of the transmission of disease and promptly and quietly safeguards human life and commercial interests with a minimum of public alarm.

The world's debt to experimental medicine can not be calculated. Vaughan has pointed out that the glory of ancient civilizations departed on account of disease and that the map of the earth has been changed far oftener by microbes than by wars. In China in the fourteenth century thirteen million died from the "Black Death" and in Europe from 1347 to 1350 twenty-five million perished from the same cause; in the eighteenth century, sixty million people died from smallpox in Europe alone. For centuries men have sought the causes of yellow fever, plague, malaria, and other diseases, and some of the guesses were near the mark. The Egyptians made the cat a sacred animal because where cats flourished there was no plague, but the relations between the cat and the rat did not suggest anything. Sir Henry Blake saw a med-

ical book in Ceylon, fourteen hundred years old, which charged the mosquito with carrying malaria. But it was not until twenty years ago that the principle of insect-borne diseases was fully established. Manson, in 1883, proved the mosquito to be the intermediate host of filaria, while Sir Ronald Ross demonstrated the real truth of the principle of insect-borne diseases only seventeen years ago; he little dreamed that it was to be but the beginning of a long series of related discoveries which would entirely end humanity's helplessness in the face of epidemic disease. To Koch we owe our knowledge of cholera, plague, and African tic fever. Reed, Carroll, and Lazear of the Medical Corps of the United States Army, proved,—Lazear at the cost of his life and Carroll almost,—that the Stegomyia plays the same role with "Yellow Jack" that the Anopheles does with malaria. In a one thousand bed military field hospital full of typhoid, at Jacksonville, in 1898, Reed, Vaughan and Shakespeare, as a commission, demonstrated to us that millions of germs were on the feet of our millions of flies and that they carried the infection from the latrines direct to the mess tables. Amebic dysentery should soon be under control owing to the epochal work by Walker (1914) and to the discovery of emetin by Rogers (1912). Thus the new creed of universal health bans the mosquito breeder of malaria, filariasis, and dengue, the flea of bubonic plague, the lice of typhus, the tsetse fly of sleeping sickness, and the tic of spotted fever; and man is not the only beneficiary, but his domestic animals as well.

The prevalence of the epidemic diseases in the torrid zone has made it the great field for research and relief workers, and today millions of souls in and near the equatorial belt are freed, not only from the devastation of epidemic diseases, but also from that of the hookworm which Wickliffe Rose has shewn in his report of 1911 has deprived them of two-thirds of their efficiency; Africa is

awakening from the sleeping sickness which made it "The Dark Continent," and preventive medicine is everywhere writing new geography of habitable territory and commercial opportunity. To the tropics, when cleaned up, we can look for the world's future supply of food, as our grazing areas are being rapidly encroached upon for farming purposes and the corn and wheat areas are dwindling in proportion to the increase of population. And the beauty of it all is that the economic value to the world of scientific medical research is represented by only an insignificant fraction of its cost, while it makes possible the development of any section of the earth, provided the price of its sanitation is furnished. The work of Surgeon-General Gorgas, which will eventually be acknowledged as the greatest single achievement which made the success of the Panama Canal possible, was done for five per cent of the total expense. Any nation or any community at home or abroad can now fix its own death rate by the amount of money it is willing to spend. It has become almost axiomatic that preventable ill health is a social crime and that the man or the community that suffers in consequence has only self to blame.

In writing on the surgery of these lands in its diagnostic and therapeutic aspects it is not possible or desirable to sharply separate the surgical from the medical and from the other general conditions; the subject needs to be treated as a whole or a wrong conception will be acquired of the surgical problems encountered. Our greatest lesson from the combination of modern science and business in the treatment of disease anywhere, is that there is absolutely no competition between the medical, the surgical and the other branches of our art, so that in remedial measures surgery is merely the mechanics of therapy.

The general principles of pathology, therapeutics, and operative technic, common to all fields of surgery, apply

in all parts of the world. Strictly tropical diseases are few and unimportant and can be described in a few words. "Tropical disease" is a term of convenience, but is hardly more accurate than would be the term "arctic disease;" though frost bite may be as rare in the tropics as heat prostration is in the arctics, neither affection could be classified as a strictly climatic condition. Certain surgical, as well as medical, diseases, whose causative agent is ubiquitous, flourish best in the warm countries, but their frequency and their control depend upon personal hygienic and general sanitary measures whose principles are also as universally applicable as are those of surgery. Good surgery, like gold, is wherever one finds it and is not modified in any way by climate. So-called tropical surgery and tropical medicine are only medicine and surgery as they occur in the tropics. All diseases are cosmopolitan; their relative incidence and the general conditions under which they occur make the only difference.

CHAPTER II

SURGERY AND SURGICAL OPERATIONS

Correct clinical surgery does not vary anywhere in the world; the organization of a proper clinic in the tropics requires the assembling of exactly the same units and material as elsewhere; untoward results of any operation can always be traced to a defect in technic. The most serious condition facing a clinic in the Far East is the distance from bases of supply and the absence of a body of trained doctors and nurses from which to select and develop an operating personnel, because when an operating group is brought together, the vacations, sickness and vacancies, which are always occurring, are often hard to fill without sending to the homeland or Europe for substitutes. There is some discomfort in the operating rooms during the warmer months, but with a minimum of clothing, masks, and gauze wristlets to take care of excess perspiration and with the normal equanimity of a surgeon, one gets along very nicely and can do nearly as much work as in other climes. Plenty of clean air without draughts is obtainable by using double wire screens on large windows near the ceiling. The usual before and after technic also obtains and the average stay in hospital is the same as in Europe or America.

It seems characteristic of the native races wherever they may be that the surest way to their confidence is through efficient medical and surgical aid. Once the word goes out that diseases hitherto regarded by them as hopeless can be cured, patients apply for relief and accept without question any measures proposed, a mental attitude greatly to their advantage. When we first offered the Filipinos major surgery, they regarded the idea with

horror until influenced by successful cases; then eighty-five thousand of them applied during the third year of the Philippine General Hospital which was opened in 1910. Surgically the Philippines are an unscratched, virgin field. From a superficial survey of five hundred thousand inhabitants living outside of Manila, I obtained data of over ten thousand surgical cases and all of the lesions reported were the visible tumors, swellings, and deformities of the unclothed parts of the body.

In this country and in Europe the laboratory is not always the essential feature in diagnosis to the extent that it is among a people where the finding of one definite cause of illness is hardly ever sufficient to account for a patient's condition. Since Oriental and other insanitary races have enjoyed a contact with Western civilization, and have begun dying out, it is not unusual to find a single individual with malaria, tuberculosis, syphilis, gonorrhea, a drug habit, filariasis, severe skin lesions, other sources of systemic disease, amebas and three or four other intestinal parasites in addition to his surgical affection, and yet to find that he is not entirely disabled by any of them; there is also the ever-present possibility of an epidemic disease such as cholera, pox or plague, all of which tends to develop the successful medical man into an Argus-eyed individual. Consequently, diagnosis and treatment, at their best, require, not only a far greater application and correlation of laboratory findings and bedside observations than in our climes, but all of the general and physical conditions of these peoples must be appreciated and taken into consideration as well. The fish and vegetable diet, nonindulgence in alcohol and the placid existence led by the majority of natives are to their advantage. They take anesthetics quietly and react favorably after severe operations. The average pulse is lower, the blood pressure about the same as in the United States, and the temperature about one degree subnormal.

The anesthetic in the Philippines is ether, given by the drop method. Miss Emma Ochsner, official anesthetist for a time in Manila, noted that it requires perhaps fifteen to twenty per cent more ether on account of the rapid evaporation than in temperate zone clinics, also that on account of the dark skins of natives, pallor or congestions were not readily recognized and that the best index to the oxidation of the blood during an anesthesia was its color in the operation wound. It is surprising to note the persistent employment of chloroform throughout the Orient. There is no excuse for offering a scanty experience of a few hundreds or even a few thousands of chloroform anesthesias without a death, as justification for using this dangerous, long since discarded drug.

One thing to be always borne in mind concerning the postoperative treatment in dealing with the most ignorant classes is, that the surgical dressings must be applied so that they can not be removed; the patients are very apt to take them off if there is much pain or discomfort.

CHAPTER III

DISEASES OF THE HEAD, NECK, AND THORAX

THE HEAD AND NECK

Harelip and cleft palate seem very common, probably because these cases are never repaired. Incised wounds are very frequent on account of the universal use of the bolo and knife in settling disputes. Several cases were seen in which the lips and a piece of the tongue have been cut off as punishment for spying during military times. In two cases in which the mutilation resulted in a pencil-sized hole where the mouth had been, a useful and presentable mouth was made by plastic surgery. The anterior nares were found closed in a number of children by the scars of smallpox. The angiomas, cysts, and neuralgias are not common. A few cases of Recklinghausen's disease in young people were seen and removed. Impaired nutrition of the cranial bones from rickets is evidenced in the frequently noted cuboidal head. There is little tendency to the general or irregular bony overgrowth conditions occasionally seen in other climes. The congenital anomalies, cephalocele, encephalocystocele, external and internal hydrocephalus are rather common and some striking cases are encountered (Fig. 1). Nontraumatic intracranial hemorrhages, tumors, infectious cerebrospinal fever and other affections of the envelopes of the brain itself, except traumatic and tuberculous meningitis and an occasional syphilis of the nervous system are infrequent.

In the neck, cysts, fistulas and torticollis are rare. The principal infectious condition is Ludwig's angina which is often met with and is often fatal if neglected. Accord-

ing to the microbic infection, which is usually a mixed one, the process in the lymph nodes is slow or rapid; it is always associated with carious teeth or some mucous membrane infection of the oral cavity. The treatment is early and free incision of the overlying skin and blunt tunneling of the induration to secure drainage. Tuberculous infection of the lymph nodes of the neck is one of the commonest conditions found and it is always associated with infected tonsils and bad teeth. Treatment for many years was by excision; later, immunization with Koch's lymph, the opening of abscesses as they

Fig. 1.—Encephalocystocele. (Author's collection.)

occur and instruction in antituberculosis hygiene were recommended.

Of malignant growths, Hodgkin's disease is next in frequency to tuberculosis of the neck, and in the Philippines, splenic anemia, or Banti's disease, probably a splenic type of Hodgkin's disease, is also frequently encountered. No treatment, except by x-rays, in a few cases, was found effective, and attempts at excision only aggravated the disease. Bunting and Yates[1] recent work holds out some promise of relief. Goiter in all its

[1]Bunting and Yates: The Rational Treatment of Hodgkin's Disease, Jour. Am. Med. Assn., 1915, lxiv, No. 24.

varieties is very common in the Philippine Islands and its course and treatment does not differ from the disease in this country. As in all unoperated countries, some extraordinary cases are encountered (Fig. 2).

Fig. 2.—Enormous goiter with colloid and fatty degeneration. (Author's collection.)

A few cases of multilocular lymphatic cysts were seen, one of enormous size that extended far out from the side of the neck, overhanging the shoulder, and extending into the depths of the neck and into the axilla in a young

Chinaman; excision of all of it was impracticable, but carbolic acid and tincture of iodine applied to the lining, which section showed to be endothelial, resulted in a cure. Cancer is always secondary in the neck except in the salivary glands in which mixed tumors are not infrequent. Lipomas, single and multiple, also are mostly found in the neck in the Far East. Nothing unusual was noted in

Fig. 3.—Cancer of the mouth and extension to the neck in a betel nut chewer (1911). (Author's collection.)

the diseases of the eye, ear, nose and throat, or the sinuses of the facial bones. In the mouth, tongue, teeth and jaws, pathology was very frequent and due to defective teeth and lack of oral asepsis. The most common site for cancer is on the side of the buccal cavity where the betel nut cud is held (Figs. 3 and 4); this chew is made of a slice

of betel, a nut of the Bonga palm, a pinch of tobacco and some lime, all wrapped in a piece of the acrid astringent buyo leaf. The effect of this fiery bolus, which turns the teeth blood red and black, aided by lesions of the inner cheek, caused by the sharp edges of decaying teeth is to furnish plenty of local irritation for the development of a primary cancer. Osteomyelitis, fluid-containing cysts,

Fig. 4.—Cancer of the cheek and face from primary cancer of buccal mucosa in a betel nut chewer (1911). (Author's collection.)

and epulis of the lower jaw were more common than in this country. Gangosa is described under syphilis.

THE THORAX

Perhaps the only diseases of the lungs and the bronchi, very common in the Tropics and unusual or not recognized elsewhere, are those due to certain fungi.

Bronchomycosis

Castellani, years in Ceylon, now of the University of Naples, has published many cases since 1905. He describes a bronchomycosis due to a variety of fungi belonging to the following genera: "1, Monilia; 2, Nocardia; 3, Aspergillus, Sterigmatocystis penicillium; 4, Mucor and Rhizomincor, Lichtheimia; 5, Sporotrichum; 6, Undetermined fungi. The symptoms are somewhat similar whatever fungus is the etiologic factor. In mild cases there are signs of slight bronchitis with mucopurulent expectoration, in which the fungi are found. In severe cases the patient presents all the symptoms of phthisis with hectic fever and hemorrhagic expectoration. Mild cases may become cured spontaneously; they are often benefited by potassium iodide." He describes in detail the form of bronchomycosis due to fungi of the genus Monilia; this type of bronchomycosis being extremely common in Ceylon, it has been possible for him to investigate it more completely.

Bronchomoniliasis

Synonyms.—Broncho-oidiosis Cast; Bronchoendomycosis Cast.

Definition.—An infection of the bronchial mucosa, due to fungi of the genus Monilia.

Etiology.—In Ceylon, the malady is generally due to Monilia tropicalis; the same fungus is found in cases coming from Southern India and the Malay States, and a very similar one in a case that apparently contracted the disease in Europe. It would appear that the fungus is the real cause of the disease, as no other etiologic agents, such as the tubercle bacillus, etc., are found. Moreover, when the patient gets better, the fungus becomes very scanty or disappears completely. In some cases Castellani observed and described thirteen other

species of Monilia but doubts whether all of them are pathogenic. The infection may take place from man to man, and also, most probably by the fungi living saprophytically in nature. Monilia-like fungi are extremely common in Ceylon, in tea dust for instance, and it is very probable that the so-called "tea-factory cough" is a type of moniliasis, as in such cases a monilia is found in the sputum, and monilia-like fungi are constantly found in the tea dust of the factories. Moreover, guinea pigs, in the nostrils of which tea dust is regularly insufflated, develop after a time a moniliasis of the lungs.

Symptomatology.—A mild and a severe type of the malady may be distinguished. In the mild type the general condition of the patient is fairly good, there is no fever, and he simply complains of cough. The expectoration is mucopurulent and very often scanty; no blood. The physical examination of the chest will reveal a few coarse moist rales or absolutely nothing. The condition may last several weeks or months, and may cure spontaneously, or, continuing, may turn into the severe type. The severe type closely resembles phthisis; the patient becomes emaciated, there is hectic fever, mucopurulent and bloody expectoration. Occasionally, true hemoptysis occurs, a teaspoonful or more of bright blood being spit up at a time. The physical examination of the chest shows patches of dullness, fine crepitations and pleural rubbing. This type is often fatal. Between these two extreme types there are cases of intermediate severity, with subcontinuous and continuous fever, more or less definite bronchial, and bronchoalveolar symptoms.

Prognosis.—The cases of a mild type may recover spontaneously or under appropriate treatment. Those of the malignant type usually end fatally.

Diagnosis.—The diagnosis of moniliasis is based on finding the fungus in the sputum. It is absolutely necessary that this should be collected in sterile Petri dishes

and examined as soon as possible, as sputum exposed to the air becomes contaminated with all sorts of fungi in the tropics. In fresh preparations of the expectoration, spore-like, roundish or oval cells, 4 to 6 micra, are seen, and some mycelial particles. The fungus is Gram-positive. To identify the fungus, cultural researches are necessary.

Differential Diagnosis.—Primary bronchomoniliasis as described in this chapter, should be distinguished from the secondary bronchomoniliasis occasionally met with in cachectic patients suffering from cancer, diabetes, tuberculosis, etc. In such cases there is generally a thrush of the oral mucosa, and the thrush monilia spreads to the pharynx, larynx, and bronchial mucosa, while in primary bronchomoniliasis the oral mucosa is not, as a rule, affected. From pulmonary tuberculosis the condition is distinguished by the absence of the tubercle bacillus in the sputum and the negative animal inoculations. Cases of mixed infection, however, tuberculosis and moniliasis, are occasionally met with, the sputum containing both the tubercle bacillus and the monilia fungus. Moniliasis differs from bronchospirochetosis by the absence of spirochetes, from endemic hemoptysis by the absence of the ova of Paragonimus westermani kerbert.

Treatment.—Mild cases and those of moderate gravity respond quickly to potassium iodide (10 to 20 grains), given well diluted in water or milk, three times daily. When potassium iodide causes severe symptoms of iodism, sajodin in the same doses in cachets may be administered. In the cases of malignant type Castellani has seen no improvement from the many different treatments tried. Potassium iodide, however, should always be tried in these cases as well as balsamics. The diet should be nourishing; hypophosphates and glycerophosphates, etc., may be tried to keep up the strength of the patient, as in phthisis.

CHAPTER IV

THE ABDOMEN

Nothing unusual was encountered in thirteen years' experience in the Philippines in the surgery of the abdomen and its contents, except in the colon, liver, and spleen. Appendicitis, gall duct disease, gastric and duodenal ulcer were not so frequent as in the United States and consequently symptoms referred to the stomach were not so common. Cancer, however, in its usual favorite localities was frequently observed.

HERNIA

In spite of the fact that the squatting posture of natives while defecating or sitting down, presses the abdominal rings firmly against the thighs, inguinal hernia is rather common among the laboring classes; it has no special points of interest unless it is that the occurrence of the sliding variety, which was encountered many times, is unusually frequent. The Ferguson-E. Wyllys Andrews type of operation was preferred. During military service in Manila during 1900-1901 I operated upon one hundred cases among American soldiers and noted an amount of fat in the cord which might be described as lipomatous and which required removal in many cases, as at that time the Bassini operation was employed. In natives little fat was found, but the appendix was a content of the sac in about three per cent, and in three cases in 250, the bladder was found; femoral hernia was very rare. All patients were kept in bed three weeks and were cautioned against heavy lifting or any overexertion for three months more.

THE SPLEEN

The pathology and surgery of the spleen have received special attention at the Mayo Clinic since 1912, and as splenic disease is very common in the Tropics and hitherto neglected through lack of knowledge concerning it, as an aid to tropic workers, permission was secured to use their publications and several are herewith reprinted from "Collected Papers of the Mayo Clinic," to which reference is suggested for fuller information. This matter will be found in the appendix.

Splenic Anemia and the Kala-azar

Splenic anemia, Banti's disease, or splenomegalia, was not uncommon and as a possible relation between this condition and Hodgkin's disease, which is so common in the Philippines, has been recently noted, these islands might be a good field for investigation. Operation was obtained in only a few cases and those were mostly unsuitable on account of extensive adhesions and liver cirrhosis.

Kala-azar, ("Kala-jwar," Indian for "black disease"), splenic leishmaniosis and internal leishmaniosis, caused by the Leishman-Donovan protozoan, probably identical with the Herpetomonas, attacks especially the endothelial cells of the circulatory system. This disease is widely distributed in Asia. It is very chronic and in the later stages with the enlargement of the spleen and liver resembles chronic malaria in its symptoms of sweating, anemia, general pains, skin pigmentation, nose bleed and marasmus. It is usually fatal. A positive diagnosis is established by splenic or hepatic puncture which will usually reveal the Leishman-Donovan bodies in large numbers. Recently Dr. Samuel Cochran of Hwaiyuan, Anhwei, China, has demonstrated that the "bodies" may be found in abundance in any lymph node in the body and he

usually takes the most accessible cervical node for diagnosis. It has been variously described under the names of infantile, Indian, Italian and Malta kala-azar and an enormous amount of investigation has been made. It is to be regarded as infectious and cases should be isolated; all vermin about both the sick and the well should be destroyed and dogs should be closely inspected, as they have a very similar disease.

No specific has been discovered, and treatment by drugs, principally quinine and arsenic, has not been satisfactory. Di Cristina and Caronia[1] (1915) have applied Vianna's tartar emetic method in ten cases of internal leishmaniosis, and report gratifying results. They gave it intravenously, injecting from 0.02 to 0.1 gram of a 1 per cent solution of the antimony and potassium tartrate on alternate days. Two of the patients were moribund. Two others were children and they were much improved; five others were completely cured and one died from acute nephritis; the dosage in this nephritis case was less than in the others, so that, if the medication was in any way responsible for the kidney disease, the kidneys must have been exceptionally susceptible. The total amount ranged from 0.06 to 0.84 gram, given in the course of ten to forty days. The children were between one and six years old; the affection was severe and of two to eight months' standing.

Mackie (*British Medical Journal,* Nov. 20, 1915, p. 745) had two prompt cures of kala-azar by injections of tartar emetic; one case of the lip and cheek and one case of the spleen and general; intravenous injections of 4 to 6 c.c. of a 1 per cent solution in normal saline every two or three days were used; there was some temperature after the first two injections; the treatment lasted about two weeks; cutaneous lesions which were slow in healing closed after a few applications of carbon diox-

[1] G. di Cristina and G. Caronia: Tartar Emetic in Internal Leishmaniosis, Pedriatria, Naples, Feb., 1915, xxiii, No. 2, pp. 81-160.

ide snow. Two per cent antimony tartrate ointment has also been efficacious. Gachet, working in Persia, claims very good results with one or two intravenous injections of arsenobenzol; as a rule one injection is necessary, he says, but sometimes two are required and the cure is complete in three to five weeks.

Rogers (*Tropical Disease Bull.*, vol. 9, No. 5, March 15, 1917) reported additional cases of Kala-azar among Europeans making 18 successfully treated by intravenous injections of tartar emetic. He states that of the 18 consecutive cases, 13 were cured; 2 greatly improved and still under treatment, 2 improved and discontinued treatment and one died of phthisis. Cases were called cured when "the fever has completely ceased for two or more months, together with considerable gain in weight and a restoration of the blood, and especially of the white corpuscles to the normal and decided diminution in the size of the spleen." Rogers suggests that in view of his results, the use of tartar emetic appears to be worthy of further study in human trypanosomiasis and sleeping sickness in Africa. The injections were continued two or three months after the fever had ceased and only stopped as a rule when the body weight had much increased, the spleen become considerably reduced, the blood had approached or reached normal and the parasites had disappeared from the spleen. It is thought that the period of treatment may be reduced by a more rapid increase of dosage. Treatment in adults is begun with 4 c.c. of the 2 per cent solution, 6 c.c. are given at the second injection and at each subsequent injection one c.c. is added, if no toxic symptoms supervene, up to 8 or 10 c.c.

See page 128 for Castellani's treatment under Yaws.

A great many cases of abscess of the spleen have been reported from China, several of which recovered after drainage, but no pathology was given.

THE COLON

Entamebic Dysentery

This disease competes with malaria for the honor of being the most ubiquitous of endemic tropical diseases. Americans first became acquainted with entamebic dysentery in 1898 during their subjugation of the Philippines and the respect soon acquired for it was such, that in the early days, although every man was greatly needed for the military operations, the discovery of a single ameba of any sort in the stools resulted in an immediate transfer of the patient to the United States. The only literature then available recognized but one variety of ameba and gave but one prognosis, death within a short time or at the latest in two or three years (Osler). Probably every man of our entire expeditionary force of over 65,000 men suffered at one time or another from dysenteric bowel trouble and it was the principal cause of disability. In recent years this disease is being found in almost every state in the Union. An enormous amount of investigation has been done by pathologists and protozoölogists notably by Schaudinn (1903), Musgrave and Clegg (1904), Craig (1905), Vedder (1906), Darling (1912), and later by Walker and Sellards (1910-1913), to determine the pathogenicity of the various species and their etiologic relationship to endemic dysentery. The recent experiments by Walker and Sellards[2] conclusively established the etiology; they differ from those hitherto performed: "(1) in the number of comparative tests made of different species; (2) in that experiments have been more carefully controlled and especially in that the species of ameboid organisms fed to, and recovered from, the experimental animal in every case have been determined; and (3) in the fact that the experiments have been

[2]Walker, E. L., and Sellards, A. W.: Experimental Entamœbic Dysentery, Philippine Jour. Sc., Sec. B, Tropical Medical, August, 1913, viii, No. 4.

made, not upon the lower animals, but upon man." These experiments showed: that the cultivable amebas are nonpathogenic; that the Entameba coli is nonpathogenic; and that Entameba histolytica is the essential etiologic factor in endemic tropical dysentery and that "Entameba

(Author's collection.)

tetragena Viereck" is identical with Entameba histolytica, and "tetragena" cysts are developed in the life cycle of Entameba histolytica, that it is a strict or obligatory parasite and can not be cultivated outside of the body and that the average incubation period of the dysentery

has been 64.8 days. All of the experimental dysenteries were obtained after ingesting Entameba histolytica from normal stools of "carriers."

Diagnosis

Clinical Symptoms.—Physical weakness, loss of appetite and digestive disturbance with or without diarrhea usually indicate the onset of parasitism of the colon by Entameba histolytica, but the relation to the local infection, in which abdominal pain and tenesmus may be entirely absent, is so often overlooked

Fig. 6.—Multiple ulcerations severe chronic entamebiasis. (Author's collection.)

that many cases are treated for the reflex gastric symptoms. The liver at times becomes congested, edematous, and swollen; back pressure in the portal system aggravates the primary colonic disease (Figs. 5 and 6), and it in turn disturbs the liver still more and the patient has "tropical liver." When the flux is not marked, and, as too often happens, a diagnosis is not made, these cases, when they die, afford examples of what Niemeyer calls "mortifying postmortem disclosures." The majority of cases, however, have frequent, mucoid and bloody stools at the outset and when the disease is well established, their main characteristic is fluidity.

Walker and Sellards acquired information of the greatest value for the diagnosis, treatment, and prophylaxis of entamebic dysentery as follows: "(1) It will be possible to make an accurate laboratory diagnosis. (2) The distinction between the pathogenic and the harmless entameba having been established, there will no longer exist an excuse for the indiscriminate treatment of all persons who show entamebæ in their stools. (3) The relatively long incubation period and the ability to diagnose latent infections make it possible to anticipate with treatment an attack of entamebic dysentery. (4) Since there is evidence that ipecac treatment, which is very efficient in relieving attacks of entamebic dysentery and causing the entamebæ to disappear temporarily from the stools, does not always kill all of the entamebæ in the intestine, treatment should always be controlled by stool examinations for Entamebæ histolytica. By this precaution, relapses, so common in entamebic dysentery, can be forestalled. (5) The following data have been acquired upon which to base a rational prophylaxis of entamebic dysentery: (a) Entameba histolytica is the essential etiologic agent in the disease. (b) The specific entameba is an obligatory parasite, and can not propagate outside of the body of its host. (c) The motile forms of this entameba, which are

passed in the bloody mucous stools in acute dysentery, quickly die and disintegrate and are probably, under natural conditions, incapable of withstanding passage through the human stomach. (d) In consequence of the relatively long incubation period of entamebic dysentery, the prevalence of chronic and latent infections, and the frequent failure of treatment to kill all of the entamebæ in the intestine, carriers of Entameba histolytica are common in endemic regions. (e) These carriers are constantly passing in their stools large numbers of the resistant, encysted stage of Entameba histolytica. (6) These facts make it probable that carriers of Entameba histolytica constitute the chief, if not the sole, agents in the dissemination of entamebic dysentery. (7) Prophylactic measures should, therefore, be directed toward carriers of Entameba histolytica, and should include the following: (a) The identification of carriers of Entameba histolytica by the microscopic examination of the stools of convalescents, household servants, and other suspects or persons whose employment or associations make them particularly dangerous to the public health. (b) The sanitary disposal of feces. (c) The treatment, controlled by microscopic examination of their stools, of all carriers of Entameba histolytica. (8) Since the incubation period of entamebic dysentery is usually long and latent infections are common, the most efficient personal prophylactic measure is frequent stool examinations, as an index for treatment, of all persons residing in endemic regions, in order to distinguish the resting and encysted entamebæ of the chronic and latent infections, which stage furnishes the most unequivocal characters for the differentiation of the pathogenic Entameba histolytica from the harmless Entameba coli."

Upon the correct microscopic diagnosis of the specific organism depend the treatment and prophylaxis; as this identification has been subject to many errors

and the extensive practical experience gained by Walker has demonstrated that the microscopic diagnosis can be made with certainty, the subjects as treated by him follow in full.

"The material for the microscopic examination for Entameba histolytica should be a stool obtained, contrary to the prevailing practice, without the previous administration of a purgative. In stools obtained after a purgative, Entameba histolytica, if present in the fluid stools, is in a preencysted stage at which it most closely resembles the nonpathogenic species, Entameba coli; consequently, a differential diagnosis between the two species is difficult and often impossible.

"It may be objected that without a purgative, infections with Entameba histolytica will frequently be overlooked. However, such is not the case. It has been my experience in following many cases of entamebic infection with daily stool examinations, including cases doubly infected with Entameba histolytica and Entameba coli, that the entamebæ are rarely absent from the normal stools several successive days and that Entameba histolytica is more constantly present, and usually present in larger numbers, in the stools of infected persons than is Entameba coli. In 930 microscopic examinations made of stools, without the previous administration of a purgative, from men known to be parasitized with Entameba histolytica, and who were not undergoing treatment, the entamebæ were found 664 times, or in 71.39 per cent; that is, in nearly 3 out of every 4 of such examinations. Moreover, the negative results were based on the examination of a single coverslip which was often hurriedly made. The examination under similar conditions of 303 stools of men known to be parasitized with Entameba coli showed the entamebæ in 171, or 56.44 per cent of the examinations; in other words, in about 1 out of every 2 of such examinations.

"A further objection that may be raised to the examination of formed stools, is the fact that in such stools usually only encysted entamebæ are to be found. It is an opinion generally held, and which is supported by the statement in all textbooks, that a positive diagnosis of entamebic infection should never be made unless motile entamebæ are observed. It is of the greatest importance, however, for the diagnosis of chronic and latent infections that one should be able to distinguish resting and encysted entamebæ from other bodies found in feces and to differentiate the cysts of Entameba histolytica from those of Entameba coli. This can be done with certainty by the experienced protozoologist. The majority of the 1,233 examinations mentioned in the preceding paragraph were made of formed stools containing nonmotile and encysted, chiefly encysted, entamebæ. Moreover, it is the encysted stage of the entameba that furnishes the most unequivocal characters for the differentiation of the pathogenic Entameba histolytica from the harmless Entameba coli.

"In the examination of liver abscess pus for Entameba histolytica, the pus first obtained after the operation usually does not contain entamebæ; frequently they appear in the pus from the drainage tube only after several days. The explanation of this is to be found in the fact that the entamebæ are not found in the pus of the abscess, but only in the tissues of its walls. Consequently, it is only when the walls of the abscess begin to slough off that the entamebæ appear in the drainage from the abscess. Therefore a negative diagnosis of entamebic liver abscess should never be made except after negative examinations obtained for several successive days after operation.

"Dysenteric or diarrheal stools should be examined as soon as possible after they are passed, since the motile entamebæ present in such stools quickly die and disintegrate. On the other hand, in the formed stools of

chronic and latent infections, the encysted entamebæ persist unchanged for days, and consequently the examination can be made at one's leisure.

"In making the examination, a small platinum loopful of the fluid or semifluid material should be placed on a microscope slide and the cover-glass dropped upon it. Slight pressure may be exerted, if necessary, upon the cover-glass with the forceps to cause the material to flow as a thin film between the cover-glass and slide. If the stools be more or less formed, a small drop of water should be placed upon the slide and a minute portion of the stool rubbed up in it, forming a fairly thick suspension of the fecès in the water, upon which the cover-glass should be placed. A satisfactory preparation must be thin, but there should not be an excess of fluid which will permit the cover-glass to float about when the oil-immersion objective is applied to it. A warm stage is not necessary for making the examination.

"The advantage of a preliminary examination of the preparation with low magnification (Leitz 3 to Zeiss AA objective) can not be overestimated. It enables the examiner to make a rapid survey of the whole preparation and to pick out the individual entamebæ for examination with the oil-immersion objective. When the entamebæ are few in the preparation, they can be found with difficulty, if at all, with higher magnification. With a Leitz 3 or Zeiss AA objective and a 3 ocular, the entamebæ appear as round, oval, or irregular, colorless, and refractive dots which with proper focusing stand out distinctly in the background of the preparation. Practical experience will enable the microscopist to distinguish them from certain other bodies that are met with in stools. By applying the oil-immersion objective—most conveniently used with the dry objective on a revolving nosepiece—to every body in the preparation that looks suspicious under low magni-

fication, this experience will soon be attained. Indeed, it is not only possible for the experienced microscopist to identify an entameba with the low magnification, but to distinguish a cyst of Entameba histolytica from one of Entameba coli with a considerable degree of certainty by the difference in its size and refractiveness. A suspected entameba, having been located in the preparation with the low power objective, should then be examined with the 1/12 oil-immersion objective. With this magnification the entamebæ present certain morphologic characters that enable the experienced investigator to identify them, whether they be in the motile, resting, or encysted stage. The motile forms will give little difficulty, even to the novice, since their movements are characteristic.

"The resting entameba is distinguished from other bodies found in the stool by its size, distinctness, regularity of contour, degree of refractiveness, and especially by its nuclear structure. The entamebæ vary in size within considerable limits, but are usually from 20 to 30 microns in diameter. They are, therefore, larger than pus cells, or other protozoa, with the exception of Balantidium coli, that are found in the stools of man. They are also more refractive than pus, epithelial, or other cells found in the stools. The nuclear structure of the entamebæ is particularly characteristic. The unencysted entamebæ possess, unless in the process of division, only a single nucleus. This nucleus is round, or occasionally slightly oval or irregular, small with reference to the size of the cell, and appears not solid but as a refractive ring (Fig. 7—*3*, *5*, *6*, *7*). This relatively small, ring-shaped nucleus appears to be absolutely diagnostic of an entameba. Only one other kind of cell observed in stools possesses a nucleus in any way resembling that of an entameba. This is an epitheloid cell, sometimes found in mucous stools, which has a ring-form nucleus relatively much larger than that of an entameba, occupying one-

Fig. 7.

(From water-color drawings by Teodosio S. Espinosa)

The illustrations in Fig. 7 are all drawn from fixed and stained preparations at the magnification of Zeiss 1/12 oil-immersion objective, ocular 3, and tube length of 160 millimeters, and with the aid of a camera lucida.

1. Motile form of a typical *Ameba,* cultivated from the Manila water supply. Note the small size, central arrangement of the chromatin in the nucleus, and the contractile vacuole.
2. Encysted form of the same species of *Ameba.* Note the small size and single nucleus with central arrangement of the chromatin.
3. Motile form of *Entameba coli,* from the stool of a healthy person. Note the dense, granular structure of the cytoplasm, the relatively large amount of chromatin and its peripheral arrangement in the nucleus.
4. Encysted form of *Entameba coli,* from the stool of a healthy person. Note the large size, the relatively thick cyst wall, the 8 ring-form nuclei, and the absence of "chromidial bodies."
5. Motile form of *Entameba histolytica,* from the stool of an acute case of entamebic dysentery. Note the reticulated structure of the cytoplasm and the scanty chromatin in the ring-form nucleus.
6. The "*tetragena*" type of motile *Entameba histolytica,* from a chronic case of entamebic dysentery. Note the structure of the nucleus. It contains a heavier peripheral ring of chromatin—a part of which is detached from the nuclear membrane—than in the typical *histolytica;* and there is a central karyosome, consisting of a central granule surrounded by a circle of chromatin granules.
7. The preëncysted stage of *Entameba histolytica,* from a "carrier" case. Note the small size, dense cytoplasm, and heavy peripheral ring of chromatin in the nucleus, which causes it to resemble a small *Entameba coli.*
8. Encysted form of *Entameba histolytica,* from a convalescent case of entamebic dysentery. Note the small size, the cyst wall, the 4 ring-form nuclei, and the "chromidial body."

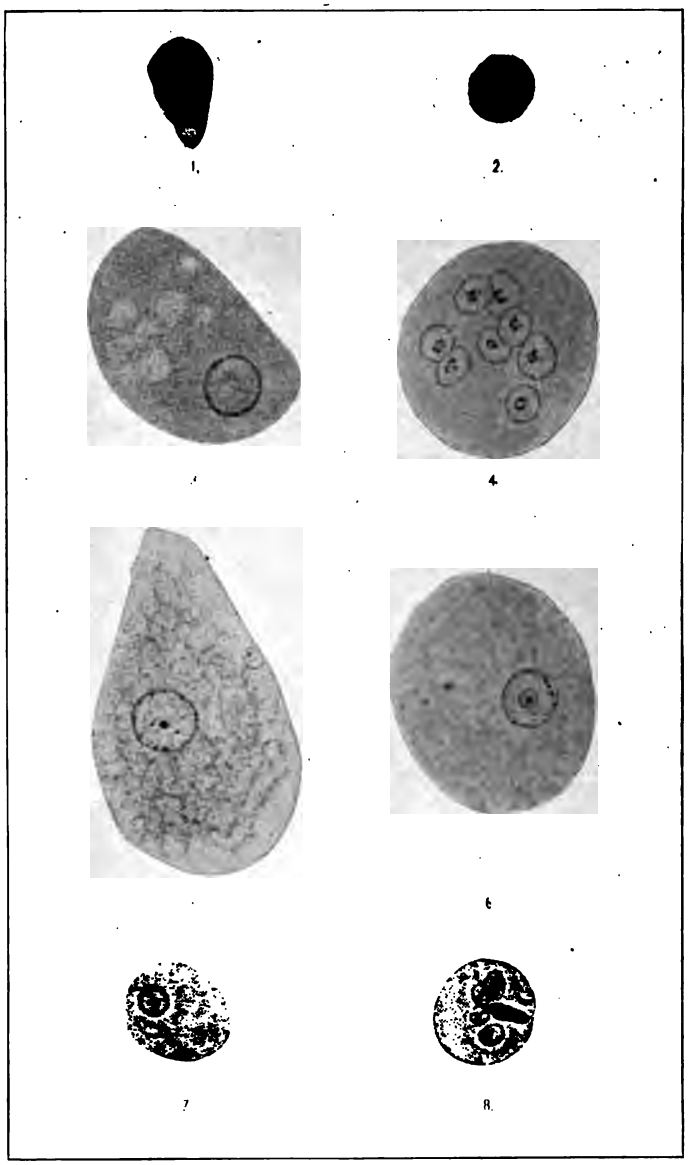

Fig. 7.—Typical examples of Ameba and Entameba. (Walker and Sellards: Entamebic Dysentery, Philippine Journal of Science, vol. viii, No. 4.)

fourth to one-half of the cell. While an entameba may occasionally be observed with an abnormally large nucleus, probably preparatory to division, the nucleus never approaches the size of the nucleus of the epitheloid cell. The latter cells are also less refractive and granular than entamebæ.

"The encysted entameba is round or slightly oval, more refractive than the resting or motile stage, and is surrounded by a more or less distinct cyst wall. The nuclear structure here also is characteristic. The cyst contains several (from 2 to 8, depending upon the species of entameba and the stage of development of the cyst) ring-form nuclei usually smaller than, but of the same structure as, the nucleus of the motile entameba (Fig. 7—*4*, *8*).

"The technic and descriptions so far given refer to the examination of living entamebæ in fresh stools. This method of stool examination of entamebæ is the quickest and for general purposes of diagnosis the most satisfactory. The preparation of stained specimens takes more time and a more extensive technic, and certain distinctive characters of the entameba are lost in the fixed and stained preparation. On the other hand, staining sometimes assists in bringing out the details of nuclear structure, and is necessary for making permanent preparations of entamebæ.

"The technic of fixing and staining entamebæ which has given the most uniformly satisfactory results is as follows: A thin smear of the fresh feces or liver abscess pus is made on a cover-glass, fixed in sublimate-alcohol mixture or Zenker's fluid for from five to fifteen minutes, thoroughly washed in distilled water, stained in aqueous alum hematoxylin from three to five minutes, washed in distilled water, passed through successive grades of absolute alcohol, cleared in xylol or oil origanum, and mounted in xylol balsam. All of the stages of this process

are most conveniently carried out by floating the cover-glass, preparation downward, upon the surface of the different liquids contained in watch glasses. The preparations should be fixed moist and should not be allowed to become dry throughout the process of staining and mounting.

"The sublimate-alcohol mixture consists of 2 parts of a saturated aqueous solution of mercuric chloride and 1 part of absolute alcohol. The sublimate solution should be saturated warm and should be kept in stock. The absolute alcohol should be added in proper proportion only at the time of using, because alcohol evaporates and the solution changes in standing.

"The aqueous alum hematoxylin has the following composition:

Hematoxylin crystals	1
Saturated aqueous solution of ammonia alum	100
Distilled water	300
Thymol	a crystal

"The hematoxylin crystals are dissolved in the water by the aid of heat, and the other substances added to the solution. The stain should be ripened for from a week to ten days in a flask or bottle loosely plugged with cotton. It is then ready for use and should be kept in a tightly stoppered bottle away from the light. It will keep in good condition for several months.

"Bodies that are liable to be mistaken for entamebæ in the stools include air bubbles, fat globules, starch or protein grains, pus and epithelial cells of the host, and certain unicellular vegetable organisms. Of these, air bubbles, fat globules, and starch or protein granules of undigested food, while possibly deceptive with low magnification, should from their structure cause no difficulty when examined with high magnification. Stools containing mucus or pus often contain many cells which are confusing to the inexperienced microscopist. It will as-

sist the observer if he remembers that these pus and epithelial cells with few exceptions are distinctly smaller than entamebæ. It will, therefore, be necessary only to take into consideration cells which, when viewed with the low magnification, are distinctly larger than the average.

"In feces containing pus there are sometimes present large round cells of uncertain identity which in size and general appearance closely resemble resting or encysted entamebæ. The cells contain from one to several small, round or irregular, refractive, nucleus-like bodies that stain like chromatin. It is possible that they are cells showing degenerative changes with fragmentation of the nucleus. These cells are, however, readily distinguished with high magnification from entamebæ by the structure of the nucleus-like bodies, which are not ring-form, but solid chromatin masses. Motile forms of entameba also will be frequently found in such stools, which will aid in the diagnosis.

"Certain unicellular vegetable organisms known as Blastocytis hominis Brumpt, which are believed to be allied to the yeasts, are found rather frequently in the stools of man in the Tropics. Smaller forms of these cells have been mistaken for the cysts of Trichomonas intestinalis, and the larger forms simulate the encysted entamebæ very closely in size and general appearance. They are, however, slightly less refractive than the cysts of Entameba, and can, therefore, be distinguished by the experienced observer, even with low magnification. Under high magnification they are seen to have a wholly different structure from the cysts of Entameba. They are round, oval, or slightly irregular, and possess a distinct wall. The protoplasm is restricted to several narrow segments of the cell, and contains from one to several granules staining like chromatin. The main body of the cell is filled with a homogeneous, hyaline, slightly refractive, and often faintly yellow mass, the nature of which is

doubtful, but it probably represents reserve food substance.

"An examination of Figs. *3* to *8* in Fig. 7 will give a good idea of the general morphology of the entamebæ. Figs. *1* and *2* show the motile encysted stages of a typical nonparasitic ameba for comparison with the entameba.

"The differentiation of Entameba histolytica from Entameba coli depends upon certain morphologic characters of the two species which are very distinctive at certain stages, but less distinctive at other stages, of the development of the two species. These stages of the development of the parasites are correlated with the clinical manifestations of the infection and especially with the consistence of the stools of the host. Therefore, the comparative morphology of Entameba histolytica and Entameba coli are most conveniently discussed in relation to the nature of the stools in which they are found; namely, (1) in dysenteric stools, (2) in diarrheal stools and stools after a purgative, and (3) in formed stools.

1. In Dysenteric Stools

"Both Entameba histolytica and Entameba coli occur only in the motile stage in dysenteric stools; and, when double parasitization exists, Entameba histolytica is usually the more numerous in such stools.

"**Size.**—The size of both histolytica and coli are subject to wide variations, and little dependence can be placed on this characteristic for diagnostic purposes. In dysenteric stools histolytica often appears larger than coli (Fig. 7—*3* and *5*). That this larger size of histolytica is only apparent, and not real, is probable from the fact that in the encysted stage (the only stage in which reliable measurements can be made) histolytica is almost invariably smaller than coli (Fig. 7—*4* and *8*). This apparently larger size of motile histolytica is probably connected with

the more active movements of this species; while coli is sluggishly motile and tends to retain a more or less spherical shape, histolytica is actively motile and is extended flat over the surface of the substratum.

"**Shape.**—Entameba histolytica, being more actively motile than Entameba coli, presents a more varied form to the observer. While coli is usually round, oval or slightly irregular, histolytica is more often long, oval, ligulate or irregular in fresh dysenteric stools.

"**Appearance.**—Entameba histolytica is hyaline and feebly refractive, while Entameba coli is more porcelaneous and refractive in appearance.

"**Motility.**—The ameboid movements of Entameba histolytica are very active in fresh dysenteric stools, and the motility of this species often persists for some hours after the stool has become cold. On the other hand, the movements of Entameba coli are always sluggish, and all motility is usually soon lost in cold stools.

"**Cytoplasm.**—The cytoplasm of Entameba histolytica is homogeneous, and in the stained entameba is seen to have a coarsely reticulated structure (Fig. 7—*5*). In cold stools it frequently appears much vacuolated. Contrary to the description given by some authors, there is no true distinction to be seen between ectoplasm and entoplasm in the resting entameba. Individual entamebæ, which contain granular material from partly digested food, sometimes present the appearance of a granular entoplasm. In motile histolytica the extended pseudopods may present a more dense, hyaline appearance than the reticulated body of the cytoplasm. The cytoplasm of histolytica may contain various cells, including red blood corpuscles, of its host. On the other hand, the cytoplasm of Entameba coli is more granular in appearance (Fig. 7—*3*). A hyaline ectoplasm is apparent only in the pseudopods of the motile entameba. The cytoplasm of coli

more often contains bacteria, starch and protein grains, and other debris from the feces than cells from the body of its host. The absence from the cytoplasm of red blood corpuscles and other cells of its host may result rather from the fact that coli is a strict commensal and is more often found in nondysenteric stools than from its incapacity to ingest red blood corpuscles.

"**Nucleus.**—The nucleus of Entameba histolytica is usually indistinct in the motile organism, especially if it be actively motile or much vacuolated. In the latter case it is sometimes impossible to distinguish the nucleus from the vacuoles. In stained preparation the nucleus of histolytica is seen to possess a thin membrane and to be relatively poor in chromatin. This chromatin is distributed as a thin peripheral layer or as scattered granules about the inner surface of the nuclear membrane, with a few granules scattered in the network of the nonrefractive, nonstainable nucleoplasm (Fig. 7—*5*). This type of nucleus is characteristic of histolytica found in stools in acute dysentery that consist exclusively of mucus and blood. In stools of chronic cases of dysentery that consist of more or less mucus and blood mixed with fecal matter, the so-called tetragena type of nucleus is commonly met with. This type of nuclear structure contains more chromatin than the preceding type, and the chromatin has a characteristic arrangement. It is distributed partly as a more or less extensive but loose layer, which frequently shows radial projections, about the inner surface of the nuclear membrane, and partly as a loose central karyosome of varying structure. This karyosome consists typically of a central granule, the 'centriol,' surrounded by a clear halo that is bounded by a layer of chromatin granules (Fig. 7—*6*). All intermediate stages between the typical histolytica and the 'tetragena' types of nuclei are to be observed in dysenteric

stools. On the other hand, the nucleus of Entameba coli is distinctly visible in the living and motile entameba as a heavy refractive ring. It consists of a nuclear membrane and a relatively large amount of chromatin which is arranged as a heavy, dense, continuous or broken layer about the inner surface of the nuclear membrane and sometimes also in a small, central, dense karyosome. The interior of the nucleus consists of a nonrefractive, nonstainable nucleoplasm (Fig. 7—*3*). Therefore, the nucleus of Entameba histolytica differs from that of Entameba coli in being less distinct, often invisible, in the living entameba, and in being poorer in chromatin. The 'tetragena' type of Entameba histolytica found in stools of chronic cases of dysentery has a nucleus more closely resembling that of Entameba coli; but the peripheral layer of chromatin is less dense, often shows radial projections, and the karyosome is loose instead of dense in structure.

2. In Diarrheal Stools

"In diarrheal stools and stools after a purgative, Entameba histolytica is usually small, sluggishly motile, or immotile, and possesses a nucleus that is distinctly visible in the living entameba as a more or less heavy peripheral ring of chromatin (Fig. 7—*7*). Therefore, it more or less closely resembles Entameba coli. These forms appear to represent changes in Entameba histolytica preparatory to encystment. They are spoken of by Darling (1913) as the 'small generation' of Entameba histolytica, and were mistaken by Elmassian (1909) for distinct species of entameba. Although the small size in part may be due to less volume, it is probable that it results in part from the contraction and rounding up of the much extended motile entameba. The increase of chromatin content of the nucleus may be considered a preparation for the multiple nuclear division that is to

take place in the cyst. While all stages from the typical histolytica through the 'tetragena' to this preencysted stage of Entameba histolytica may be found in diarrheal stools or stools after a purgative, the predominance of the preencysted stage and the more or less resemblance of it to Entameba coli make the differentiation of the two species difficult and sometimes impossible in such stools.

3. In Formed Stools

"In formed stools both Entameba histolytica and Entameba coli are present in the encysted stage, and it is this stage of the entameba that presents the most distinctive character for making a differential diagnosis. Furthermore, the identification of Entameba histolytica in the encysted stage in formed stools is extremely important for the diagnosis of chronic and latent infections and for the control of treatment of entamebic dysentery, and constitutes one of the most efficient factors in the prophylaxis of this disease.

"The cysts of Entameba histolytica (Fig. 9—*8*) are relatively small, from 10 to 15 microns in diameter. They are round, or occasionally oval, moderately refractive and have a thin cyst wall. The completely encysted entameba contains 4 ring-form nuclei and, usually, one or more elongated refractive bodies, that stain with chromatin stains and which have been designated by Hartmann as chromidial bodies. On the other hand, the cysts of Entameba coli (Fig 7—*4*) are larger (from 15 to 20 microns in diameter), more refractive, and usually possess a thicker cyst wall. The completely encysted entameba contains 8 (occasionally more) nuclei and does not include 'chromidial bodies.' The encystment of Entameba coli appears to proceed more rapidly than that of Entameba histolytica, so that from two to six nuclear stages are infrequently met with. In the case of Enta-

meba histolytica, nuclear multiplication appears to take place early, so that from two to four nuclear stages are frequently seen before encystment is complete, indeed, occasionally in the motile entameba.

"For convenience of reference, the more distinctive and constant characters of Entameba histolytica and Entameba coli are tabulated.

Motile Stage

A. Entameba histolytica	*B. Entameba coli*
1. Appearance hyaline.	1. Appearance porcelaneous.
2. Refractiveness more feeble.	2. Refractiveness more pronounced.
3. Movements active in the fresh stools.	3. Movements sluggish.
	4. Nucleus distinct.
4. Chromatin of nucleus scanty.	5. Chromatin of nucleus abundant.

Encysted Stage

A. Entameba histolytica	*B. Entameba coli*
1. Cyst smaller.	1. Cyst larger.
2. Cyst less refractive.	2. Cyst more refractive.
3. Cyst usually contains elongated refractive bodies known as "chromidial bodies."	3. Cysts do not contain "chromidial bodies."
4. Nuclei never more than 4.	4. Nuclei 8, occasionally more.
5. Cyst wall thinner.	5. Cyst wall thicker.

"Therefore, in dysenteric stools and sometimes in diarrheal stools, the characters of the motile Entameba histolytica are fairly distinctive, and the experienced observer will have little difficulty in identifying the species. Unusually, however, in diarrheal stools and in stools after a purgative, Entameba histolytica is in a preencysted stage in which it closely resembles Entameba coli, especially in its sluggish motility and its distinct nucleus containing much chromatin. It is for this reason that I have insisted upon stool examinations without the administration of a purgative. In the case of natural diarrheal stools, diagnosis can usually be made by an experienced protozoologist by a careful study of the stools on successive days; but it is always advisable to endeavor to

obtain a formed stool. Formed stools, when they can be obtained, are always to be preferred for making a laboratory diagnosis of entamebic infection, because the encysted entamebæ in such stools present the most distinctive morphologic characters for the differential diagnosis between Entameba histolytica and Entameba coli. Finally, it is to be insisted upon that a negative diagnosis should never be made on a single stool examination, since the entamebæ may occasionally be absent from the stools of an infected person; nor upon the identification of Entameba coli in a stool, since there may exist a double parasitization with this species and Entameba histolytica. In all such cases a diagnosis should be based on several examinations made on different days."

The following matter is quoted from an article by A. W. Sellards and W. A. Baetjer:*

"In the diagnosis of amebic dysentery, it is ordinarily considered essential that the presence of E. histolytica be demonstrated in association with definite clinical symptoms. In three cases of obscure diarrhea it was found that amebæ were present in the intestine, which could not be identified morphologically with either E. histolytica or E. coli. Animal inoculation proved that these amebæ were definitely pathogenic, the symptoms which characterized the disease in the patient appearing in the animals. After a careful consideration of the various factors involved in these cases, we feel that it is necessary to diagnose amebic dysentery (intestinal amebiasis) under conditions in which the clinical symptoms are distinctly atypical and the amebæ present vary markedly in their morphology from E. histolytica. Indeed, amebic dysentery must sometimes be diagnosed in the absence of trophozoites and when only two- and

*The Recognition of Atypical Forms of Intestinal Amœbiasis, Bull. Johns Hopkins Hosp., February, 1915, xxvi, No. 288.

three-nucleated cysts are present. A diagnosis under such conditions should be confirmed by the inoculation of animals.

"As regards the systematic position of these strains, and their relation to histolytica, definite evidence was obtained that the amount of chromatin which characterizes the nucleus of E. histolytica may undergo fairly marked variation. Also the number of nuclei in the propagative stage has always been considered as being sufficiently constant to furnish a satisfactory basis for the differentiation of species. In these strains marked variation occurred in the number of nuclei in the cysts, sometimes only two and three being found, and under other conditions four and often five or six nuclei. Consequently we prefer to regard the strains of amebæ occurring in these cases, not as a new variety, but as an atypical histolytica temporarily modified by environment.

"For the present it seems permissible to recognize only two entamebæ of man, namely E. histolytica and E. coli. We do not feel that E. polecki (v. Prowazek, 1912), found sometimes in man, or E. testudinis (Hartmann, 1910) of certain animals can be accepted as distinct species, in view of the limited information concerning the characteristics of the vegetative stage under changing conditions of environment, the absence of specific tests for pathogenesis in a susceptible host and the absence of information concerning the propagative stage."

Treatment

In writing on this subject in 1911, in describing the curiosities of the statistics, I made the slighting statement, "that according to some authors, there is no reason for dysentery existing in the same world with ipecac," and it has since come to pass that treatment by emetin,

an inspiration of Rogers,[3] is the greatest chemotherapeutic triumph of recent times. It apparently cures, with a magical celerity, amebic dysenteries in any except a dying stage. One-half grain of the hydrochloride of emetin hypodermically, as an initial dose, and one-third of a grain three times a day for about ten days, as recommended by Vedder,[4] is followed by no unpleasant effects, such as occur from large dosages which run as high as four to five grains a day. When the patient seems cured, the treatment should be suspended and the stools, beginning fifteen days after, watched for several months, for Entameba histolytica, especially in the resting or encysted stages. Any recurrence of symptoms demands a second course of treatment, when larger doses may be employed. Walker's experiments prove that the emetin treatment does not kill all of the entamebæ in the lumen of the intestine and these cases become chronic carriers and a menace to their neighbors, as he asserts that dysentery is propagated almost solely by these carriers who are constantly passing in their stools, often in enormous numbers, the resistant encysted stage of Entameba histolytica. The treatment of these carriers is of the utmost importance. Emetin used by colonic irrigations has given very bad results. It is possible that the amebas may be removed from these carriers by a course of quinine, 1:1000, or of silver nitrate, 1:1000, irrigations.

In addition to emetin hypodermically, some are now using freshly made salol-coated ipecac pills, and begin with a huge dose, usually about eighty grains a day in four doses of twenty grains each. The patient is kept quiet, on a light diet, and the dose is reduced about ten grains a day; every four or five days the ipecac is stopped and a good saline cathartic is given. The dose is run

[3]Rogers, Leonard, I. M. S.: The Rapid Cure of Amebic Dysentery and Hepatitis by Hypodermic Injections of Soluble Salts of Emetine, Brit. Med. Jour., June 22, and Aug. 24, 1912.

[4]Vedder, Edward B.: Origin and Present Status of the Emetine Treatment of Amebic Dysentery, Jour. Am. Med. Assn., February 14, 1914.

down until the patient is getting about ten grains a day. This, they claim, is usually effective in ridding the stools of all entamebæ, as the ipecac, internally administered, mixes with the feces and comes in direct contact with the encysted parasites.

The last word on this subject will not be written until a further study of the effect of ipecac and emetin has been made, so that they can be employed to destroy all of the entamebæ in the patient, especially in the stools of carriers.

Since the discovery of emetin only grossly neglected cases in which the colon has suffered severe structural damage may require irrigations through an appendicostomy or better a cecostomy; although emetin has destroyed all of the Entamebæ histolytica in the bowel wall in such cases, they die from sepsis; in some of these patients a cecostomy under local anesthesia may be indicated. Most of the recent work (1916) on amebiasis has been concerned with the medical treatment of carriers in which the subcutaneous injection of emetin hydrochloride fails.

The greatly increased use of emetin recently, especially by quacks, and the appearance in the market of an impure product has put the profession on its guard against poisoning and even death from this drug although administered in small amounts. One fatal case at the Johns Hopkins Clinic received one and one-half grains for twenty days; the symptoms were diarrhea, acute renal insufficiency, acidosis, blood in the urine, and bronchopneumonia; the patient died thirty days after the first injection and ten days after the last. It must always be remembered that the products supplied as emetin hydrochloride are variable in composition and in toxicity to a degree which constitutes a serious danger. Physicians should insist on some declaration from the firm supplying the drug as to its purity and as to the standard employed. (Jour. Am. Med. Assn.)

Treatment of Carriers with Oil of Chenopodium.[5]—Fourteen carriers, all men, were treated by Walker and Emrich with oil of chenopodium at the Candelaria Hospital of the Madeira-Marmoré Railroad Co., Porto Velho, Amazonas, Brazil; ten were cured and four remained apparently uncured; they believed that the latter might have been cured had they received satisfactory preliminary purgation. In the ten cured cases, six resulted from a single treatment; one after a double treatment with one day's interval between, and three after three treatments following two relapses. The technic found most effective consisted of (1) magesium sulphate, ½ to 1 ounce, at 6 A. M.; (2) oil of chenopodium, 16 minims, in gelatine capsules at 8 A. M., 10 A. M., and 12 M., and (3) castor oil, 1 ounce, containing chloroform, 50 minims, at 2 P. M. This dosage is for adults. The preliminary purgation is most important; its purpose is twofold, first to remove the excess of fecal matter, and, second, to bring the entamebas out of their protective cysts and subject them in the vegetative condition to the action of the chenopodium. It was found that this preliminary purging must absolutely secure free fluid bowel movements before the chenopodium is given and that the chenopodium must be administered while the stools are fluid. Finally, the stools must be examined repeatedly after the treatment by one capable of identifying Entameba histolytica in the resting, encysted, and motile stages. At least three examinations on different days are advisable; when possible, examinations should be made at intervals for some weeks or months in order to be sure of a cure.

Prophylaxis

According to Walker's experiments, the knowledge of the part which these carriers of Entameba histoly-

[5]Walker and Emrich: Jour. Am. Med. Assn., May 19, 1917, lxviii, 1456.

tica probably play in the spread of entamebic dysentery, together with the ease and certainty with which such carriers can be detected by microscopic examination of their stools, makes the prophylaxis of this disease relatively simple. It is believed that it would be possible, were it practicable, to eradicate this disease from any region by a systematic examination of stools and the treatment or isolation of all persons found to be carriers of Entameba histolytica. In the absence of such thoroughgoing prophylactic measures, a sanitary disposal of all fecal matter should be insisted upon and household carriers of Entameba histolytica should be eliminated. Native household servants who cook and handle food, who are usually more or less uncleanly in their habits, and some of whom are carriers of Entameba histolytica, are believed to be one of the chief sources of infection of white persons residing in the Tropics; and, as a most essential prophylactic measure, stool examinations should be made of all such servants and those found infected should be discharged or subjected to treatment.

Equally important is the matter of personal prophylaxis. On account of the relatively long incubation period of the disease and the frequent occurrence of chronic and latent infections, it will usually be possible to anticipate with treatment an attack of dysentery. If persons residing in endemic regious would have frequent stool examinations made by a competent protozoölogist, and, if at any time parasitization with Entameba histolytica having been discovered, would undergo treatment, it is believed that it would rarely be necessary for a person to suffer from entamebic dysentery. A stool examination made once a month would ordinarily be sufficient to anticipate an attack. Such a procedure would constitute a most efficient method of personal prophylaxis.

Balantidial Dysentery

The first case was reported in 1857 in Sweden. In 1904, 125 cases were collected from every country and since then 12 cases have been published. In the Philippines this infection is not uncommon and it is probable that parasitization with Balantidium coli is frequently overlooked on account of the few clinical symptoms and

Fig. 8.—Colon of man dead from Balantidium coli infection. (Bowman.)

the infrequent appearance of the parasite in the stools of infected persons.

Clinically, it is recognized by the parasite in the stools; some of the cases show a diarrhea or dysentery. The parasites may be absent for weeks and when found are usually in small numbers, as many of the infections are latent. The mortality is not known. The postmortem pathologic changes show atypical blackish ulcerations of

the colon (Fig. 8). The Balantidia were found in the wall of the gut, the regional lymph nodes and in blood vessels and lymph spaces, singly or in groups (Figs. 9, 10, and 11). Liver abscess has not been observed. Monkeys and pigs are naturally infected. An examination of pigs in the Philippines convinced Walker[6] that a large propor-

Fig. 9.—Section of large intestine of monkey, showing three Balantidium coli suis in the deeper part of the mucosa. (Walker: Experimental Balantidiasis, Philippine Journal of Science, VIII, B, No. 5.)

tion of them are parasitized with the encysted protozoon, but it does not produce symptoms or lesions in its host, although they are morphologically identical with those in man.

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[6]Walker, E. L.: Experimental Balantidiasis, Philippine Jour. Sc., October, 1913, Sec B, viii, No. 5.

Treatment

Walker[7] determined quantitatively that the compounds of arsenic and antimony, the aniline dyes, ipecac and emetin, and quinine, possess little or no balanticidal action, but the salts of the heavy metals, especially mercury and silver, were eminently balanticidal; that it is possible

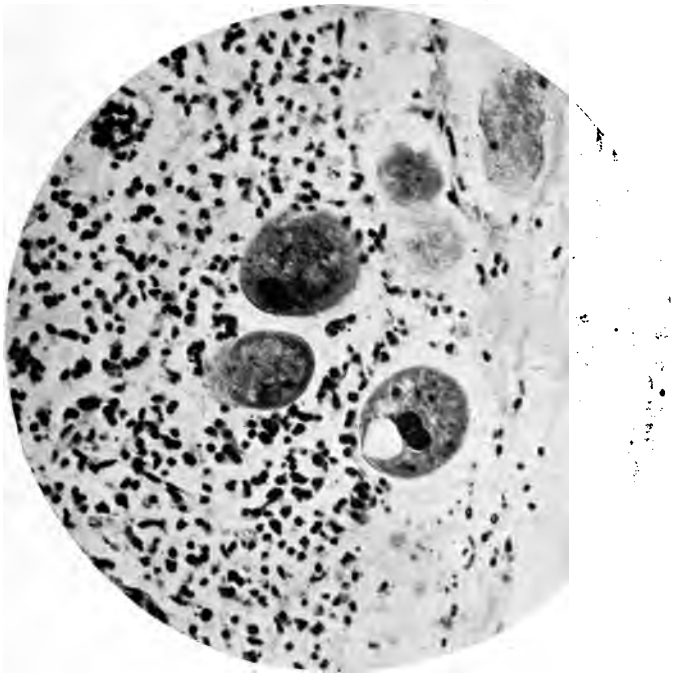


Fig. 10.—Section of a mesenteric lymph gland of monkey, showing several Balantidium coli hominis in the edge of the glandular tissue. (Walker: Experimental Balantidiasis, Philippine Journal of Science, VIII, B, No. 5.)

that some of the inorganic salts of mercury or silver, given by mouth or hypodermically, might be efficient, as they are eliminated in part by the mucosa of the large intestine, but the local treatment is impracticable because they are precipitated by albumin and are relatively

[7]Walker, E. L.: Quantitative Determination of the Balanticidal Activity of Certain Drugs and Chemicals as a Basis for Treatment of Infections with Balantidium Coli, Philippine Jour. Sc., 1914.

toxic to man. The practical value of the organic compounds of silver which possess considerable balanticidal activity can be determined only by clinical experience.

Bacillary Dysentery

Bacillary dysentery, caused by groups of closely related bacilli, is sporadic and prone to become epidemic.

Fig. 11.—Section of the large intestine of a man dead from Balantidial dysentery. (Walker: Experimental Balantidiasis, Philippine Journal of Science, VIII, B, No. 5.)

The accepted etiologic organisms are the Shiga bacillus and the Flexner bacillus associated with the Bacillus coli, which occur throughout the intestine but principally in the lower bowel. The onset may be sudden, although a premonitory period of gastrointestinal disturbance of one or two days is not uncommon; this is characterized by griping, tenesmus, fever, and diarrhea until blood and

mucus form the entire discharges with a continued desire to defecate. The most severe cases have resulted fatally, within four days, from gangrene of the colon; mild forms often recover on the third or fourth day while still in the mucous stage. The surgical complications are few compared with entamebic dysentery. Allbutt and Rolleston mention arthritis of the large joints as a rather frequent sequel; general sepsis and even pyemia, with parotitis, diffuse abscess or peritonitis are also occasionally met with. The liver in the majority of severe cases shows more or less evidence of hepatitis with congestion, but abscess formation is very rare. Paralysis of the lower extremities, of the sphincter ani or of the bladder, hemorrhoids, prolapsus ani, cystitis, nephritis, and especially gastroduodeno-hepaticopancreatic disorders are most common.

Under treatment by drugs the disease has a mortality of ten to thirty per cent. The antitoxic serum prepared by Shiga from the bacillus strain bearing his name is followed by remarkable results and a mortality of less than one per cent in cases infected by the bacillus; no serum against the Flexner bacillus or other acid strains seems to be effective as at present prepared. Vaccine treatment has not been successful.

A description of other surgical diseases of the colon such as tuberculosis, carcinoma, dilatation, prolapse and infections, secondary to general diseases, would not differ materially from these conditions encountered elsewhere.

General Intestinal Parasitism

At least seven different parasites influence surgical prognosis and give rise to dysenteric symptoms; amebic, malarial, balantidial, kala-azar (not yet found in the Philippine Islands), schistosomal, bacillary and esophagostomal (not yet found in man in the Philippine Islands).

Many forms of verminous disturbance of the intestinal function remain to be described. Statistical studies of the evidence of intestinal worms among Filipinos, although so far based mostly on but one coverslip preparation with no preliminary catharsis, nevertheless show that such intestinal parasites as ascaris, trichuris, hookworm, oxyuris, tenia, hymenlepsis, and strongyloides are so common that at least one hundred per cent of Filipinos harbor one or more species of these intestinal worms; there are very few single infections per one hundred persons and 1.85 infections per person seems to be a fair estimate of intestinal helminthiasis among Filipinos. These estimates are based on the examinations of 19,302 natives from every part of the Islands. To this may be added the examinations of the stools of over 6,000 Filipinos in St. Paul's Hospital, Manila, from 1905 to 1910, which showed about 1.50 infections per person.

Lartigau has shown that bowel parasites and their products and bowel bacteria are carried to the liver by the portal system and that on their way back to the bowel they not only excite disturbance of hepatic structure and function, but cause various infections of the bile tract and mucosa; the gut again suffers by receiving the secretion of a damaged liver and a pathologic vicious circle is established. They also cause profound reflex disturbance of function in the gastroduodeno-hepatico-pancreatic physiologic system secondarily, by acting as irritants in the large bowel, just as a chronic appendix reflexly causes gastric and duodenal disturbances, which in turn interfere with the mechanism of secretion, storage, and outflow of digestive secretions and of bile, thereby producing conditions favorable both for bacterial infection in the gall bladder and for systemic infections. The importance to the surgical patient of correcting these intestinal conditions is very great: for instance, nearly fifteen per cent of Philippine typhoids have hemorrhages.

THE LIVER

Entamebic Abscess

It is merely another tribute to the marvelous ability of the liver to dispose of the poisons and pathogenic organisms which pass in contact with its cells, that abscess, secondary to a colon parasitized with entamebæ, is not more frequent; because the parasites are usually to be found in the portal vessels together with the daily output of other septic and toxic substances from the diseased gut. Interpretation of clinical signs and symptoms and the treatment of liver infections demand consideration of the following: the extensive relationship of the organ to other derivatives of the primitive gut; its wonderful function; its fixed, for clinical purposes, position; its great friability; its great vascularity, especially during the portal obstruction and back pressure of an acute hepatitis; that its veins have no valves and lack contractible tissue; that it has two vascular systems, the main trunks of each in one pedicle, which can be completely controlled by digital or forci-pressure; and finally the clinical importance of the accessory portal systems and the variations in their blood pressure.

Diagnosis and Treatment of Liver Abscess

When the colonic infection is chronic, there often occurs an acute parenchymatous, cloudy swelling of the liver in which an ameba-laden embolus from a septic thrombophlebitis of the ulcerated colon finds both lodgment and the conditions favorable for developing an abscess. Enlargement of the liver and an exacerbation of the dysentery, rise of temperature, marked leukocytosis, sweating, pain between the ribs on pressure and in the shoulder, make the diagnosis easy; but some solitary abscesses are practically without symptoms until they become large and cause marked pain from tension, or

until a dry grunting cough indicates threatened perforation into the lung. Exploratory puncture is dangerous, unless one is prepared to follow up a discovery of pus by immediate operation before withdrawing the needle.

Fig. 12.—Liver. Upper surface showing minute multiple foci of secondary infection from entamebiasis of the colon. (Author's collection.)

Fluctuation can of course never be detected. When the diagnosis is difficult and the patient's condition is fair, one can often safely follow an expectant plan for a fortnight or longer.

Fig. 13.—Liver. Cut surface of same specimen as Fig. 12. (Author's collection.)

The proper way to examine a liver for pus is to expose sufficient of its surface to allow of thorough and repeated hollow needle exploration from day to day; this is readily provided for by packing a wound widely open until adhesions have formed about an opening that is

floored by the liver, preferably on the outer surface of the right lobe. As emetin hypodermically will search out and destroy entamebæ wherever they may be in the living tissues, entamebic liver abscess, unless a mixed infection, is now very soon arrested, rendered sterile as to parasites, and needs drainage for a short time only to effect a cure of the large solitary variety.

Fig. 14.—Liver. Section of right lobe with large multiple abscesses, showing beginning coalescence of three central abscesses. (Author's collection.)

It is possible that the hitherto hopeless form of multiple, minute abscesses (Figs. 12 and 13), sprinkled throughout the entire liver substance, or even the larger kind (Fig. 14) will become arrested, and in time absorbed by natural processes after emetin has killed off the pathogenic parasites. In an experience of over one hundred cases of liver abscess which I operated upon between 1900 and 1907, ninety-five per cent were in the right lobe and

Fig. 15.—Liver. Solitary superficial entamebic abscess on outer surface of right lobe. (Author's collection.)

Fig. 16.—Curvilinear incision to expose 9th and 10th ribs.

of the so-called single variety (Fig. 15); ninety per cent of these recovered; one case of multiple abscesses in which two or more small abscesses, which may have been the only ones, were reached and opened, also recovered. Even

after efficient use of emetin the old law, *ubi pus ibi evacuo,* will always prevail; the method of attack must be decided upon according to the location of the pus. British sur-

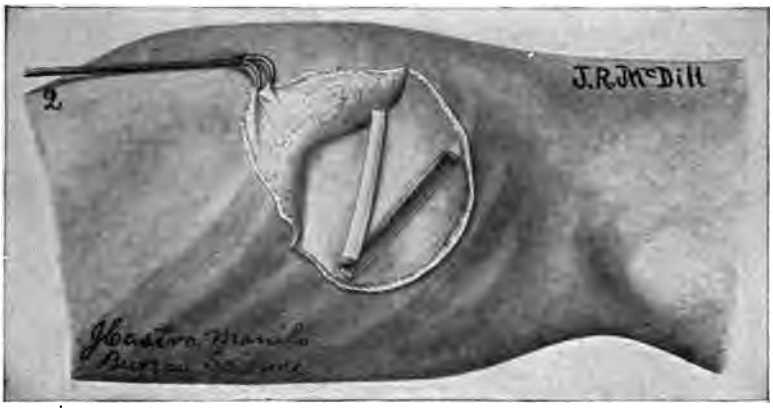


Fig. 17.—Resection of four inches of 10th rib; resulting gutter to be closed immediately by catgut suture.

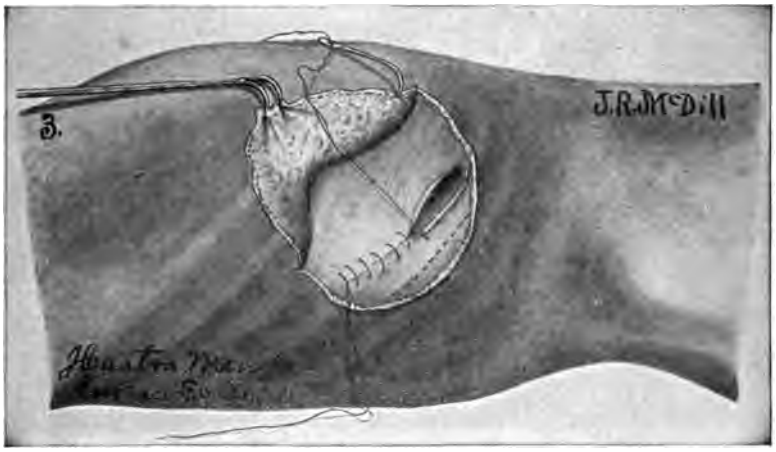


Fig. 18.—Cavity or gutter left by rib resection, partly sutured; dotted line below indicates the next incision which is close to the upper border of the 11th rib and extends into the peritoneal cavity through all layers of chest wall and diaphragm.

geons in the Tropics are partial to a quick and easy method by aspiration and syphonage and the instrument makers sell many sets of special instruments for this

purpose devised by Manson and others. Like all operations in which the operator can not see what he is doing, it has few terrors for the most timid. Such a procedure is unscientific and unsafe but has its uses and is to be commended to one untrained in surgery when conditions are such that a surgeon is not available.

The Abdominal Route.[8]—When the liver dullness ex-

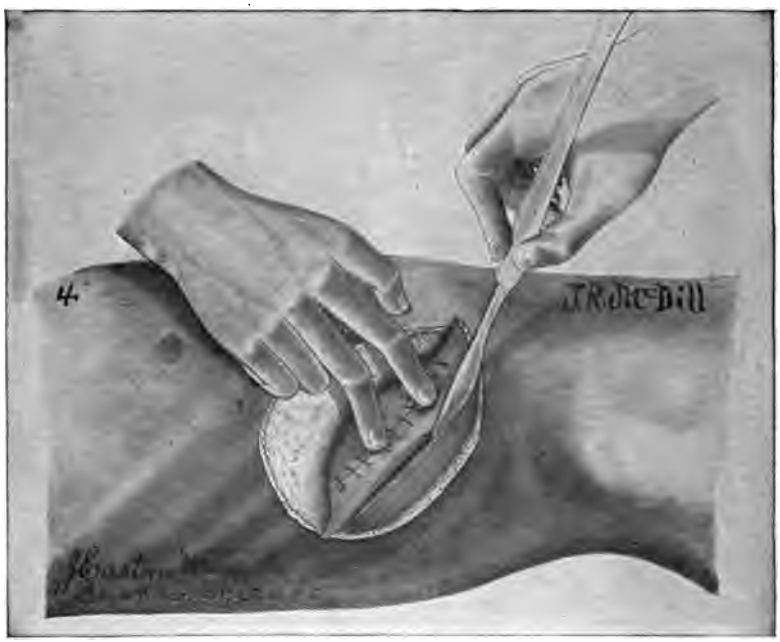


Fig. 19.—While incision into the peritoneal cavity is being made the mobilized chest wall is held firmly against the diaphragm by two fingers of an assistant; this should prevent entrance of air into the pleural cavity until the cut edges of chest wall and diaphragm can be clamped together and then sutured, making air tight closure of the pleural cavity.

tends well below the costal margins and especially when the organ bulges anteriorly as it sometimes does in neglected cases, the abdominal route, preferably through the right rectus muscle, if visceroparietal adhesions are encountered, amounts to nothing more than a simple oncot-

[8]McDill, J. R.: Tropical Infections of the Derivatives of the Primitive Gut: Their Complications and Treatment, Surg., Gynec. and Obst., Nov., 1911, 523-558.

omy. If adhesions are limited and recent, or absent, the abscess cavity if accessible should be opened through a ring of gauze packed between the liver and the abdominal wall, either immediately or after forty-eight hours, according to the two-stage principle. A transpleural operation to attack a liver abscess, before it has developed to an extreme stage or before the liver swelling is evident

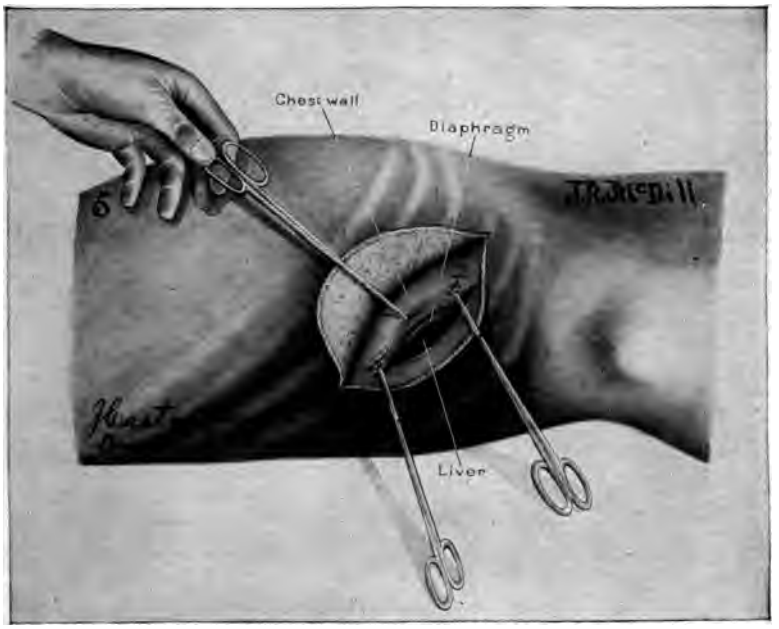


Fig. 20.—For demonstration only; the edges of chest wall and diaphragm, which are to be united by suture, are held apart.

on inspection, gives the best access to the entire right lobe in which ninety-five per cent of abscesses are found. This exposure of the liver surface is not affected, except favorably, by the great reduction in size that occurs within twenty-four hours after needling a swollen liver; if pus is not found at the time of operation, the organ can be explored through the wound daily for weeks, if

necessary, with the hollow needle, under cocaine anesthesia.

The following procedure avoids pneumothorax and empyema and has been quite satisfactory:[7] 1. Place the patient flat on the back or with the right shoulder and hip raised a little with the right arm at right angles to the body. 2. (Fig. 16) Curvilinear incision to expose ninth and tenth ribs. Reflect in one flap all of the tissues down to, but not including, the fascia overlying the muscles. 3. (Fig. 17) Subperiosteal resection of 10 cm.,

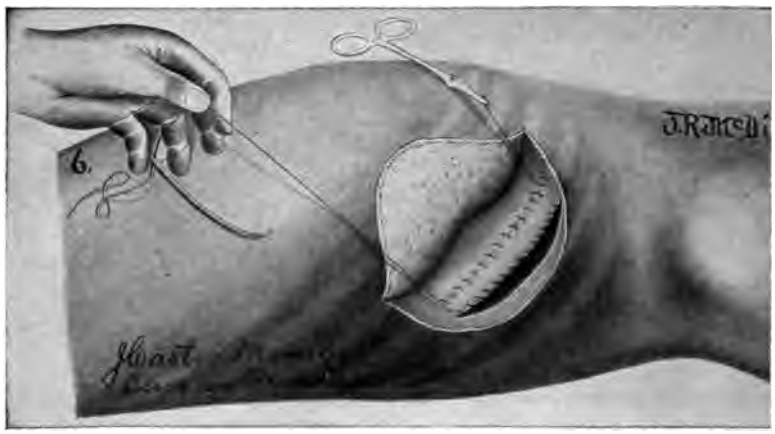


Fig. 21.—Suture of chest wall and diaphragm completed, showing exposure of liver.

(4 inches) of the tenth rib; removal of the ninth rib also is sometimes indicated; great care is necessary to avoid wounding the periosteal bed composed of periosteum, endothoracic fascia and parietal pleura; close the resulting gutter immediately with a running catgut suture through the entire thickness of the musculature. This results in a loose and movable section of the chest wall. 4. (Fig. 18) Cavity or gutter left by rib resection partially sutured. The dotted line below indicates the next incision which follows closely the upper border of the eleventh rib; it is coextensive with the rib resection and extends into

the peritoneal cavity dividing all layers of the chest wall and the diaphragm. 5. (Fig. 19) While this incision is being made, the fingers of an assistant firmly press the loosened chest wall inwards and against the diaphragm to prevent pneumothorax when the incision opens or crosses the pleural sac; as soon as the pleural cavity has been passed and the thickness of the diaphragm divided, the peritoneal cavity is opened; this should occur first about the center of the wound; the two upper, cut margins of mobilized chest wall and diaphragm, respectively, are

Fig. 22.—Mikulicz pack to procure adhesions, after failure to find an abscess; through the adhesions daily explorations, with cocaine, can be made, if necessary, until pus is found.

then clamped together with two or three forceps, effectually closing the pleural cavity. The opening can now be extended right and left by first securely clamping the diaphragm to the chest wall, and when a running catgut suture replaces the forceps, making air-tight closure of the pleural cavity, the liver is freely exposed and ready for even a manual exploration. Fig. 20 demonstrates the cut edges of chest wall and diaphragm held apart; between the flaps the pleural cavity is shown; below is the liver. Fig. 21 shows coaptation by suture of the edges

of chest wall and diaphragm completed, showing extent of exposure of the surface of the right lobe of the liver. Fig. 22 shows a case in which pus is not found at the time of operation, showing gauze packed in a Mikulicz bag which extends beneath the wound margins covering an area of liver surface about 6.5 cm. (2½ inches) in diameter.

After adhesions form, the liver can be explored daily if necessary under local cocaine anesthesia. In one case

Fig. 23.—Drain in place, gauze ring around tube to prevent soiling of peritoneum and to form adhesions.

the abscess had not developed sufficiently to be located and drained until three weeks after the original operation. Fig. 23 shows the tube in place surrounded by gauze pack; sutured margin held up showing parietal peritoneum on under side.

Fig. 24 is a diagrammatic sketch showing the layers incised and the digital method of preventing pneumothorax until the diaphragm and the chest wall edges are united. Pneumothorax, all statements to the contrary

notwithstanding, is always a very serious accident even to a healthy man and should it occur during an operation, in spite of all precautions, the steps of the operation should be completed and the air and also any fluid encountered in the pleural cavity should then be aspirated

Fig. 24.—Diagrammatic sketch showing layers incised and digital method of temporarily preventing pneumothorax till diaphragm and chest wall are sutured.

by means of a Potain aspirator, using a medium-sized cannula with a blunt end. With the aid of a differential pressure apparatus the operation can be done very easily and rapidly and the pressure can be dispensed with as soon as the pleural cavity is closed. The usual enlargement of the right lobe narrows or even temporarily

obliterates, in some cases, the angle of the pleural space which greatly facilitates the operation. The right lobe after this exposure can now be palpated upwards on the dome and on its posterior surface downwards and forwards; the anterior surface and margin and sometimes, if not greatly enlarged, the under surface can be reached by the examining fingers. The liver, when acutely edematous, will bulge freely into the wound, is bluish in color, and soft and pulpy to touch. The indications to the exploring fingers of underlying abscesses are peritoneal adhesions and resistance or hardness due to pus tension. Before incising an abscess or before exploring with the hollow needle and syringe, pack off with a ring of gauze which may be fastened in place by two or three No. 1 catgut stitches to the parietal peritoneum, although this is not often necessary; sewing to the liver surfaces is seldom satisfactory.

If the operator prefers to wait for parietovisceral adhesions before opening an abscess, if the condition of the patient requires it, fasten the exploring needle *in situ* as the cavity may not be readily found again because an edematous liver invariably shrinks very rapidly after any operative handling. When an abscess near the surface has been opened and its cavity can be reached, its walls should be palpated for neighboring pus collections, supplemented by the aspirating needle, and if the partition between cavities is not too thick, it can be broken down by a long forceps; if there seems too much intervening liver tissue, it can be more safely left to work its way towards the opening cavity in which the tension has been relieved, when it can be opened later if it does not open spontaneously by confluence. Open deep abscesses by a narrow stab incision, using the needle as a guide and enlarge the opening with forceps or the finger. As soon as the abscesses are opened, insert a large rubber tubular drain, stop, and put the patient to bed. Flush-

ing, curetting, sponging out, etc., are all contraindicated. The causes of death in this class of cases are too often due to too much operating, too much anesthetic, too much loss of blood, and consequent shock. These operations can be suspended at any moment after the liver has been exposed and be completed later under local anesthesia.

Treatment of Hemorrhage from the Liver.—Normally the liver blood pressure is very low but in a considerable percentage of chronic dysentery cases some hepatic condition has developed which may cause enough obstruction and consequent increase of intravenous portal blood pressure so that the back pressure will produce in liver

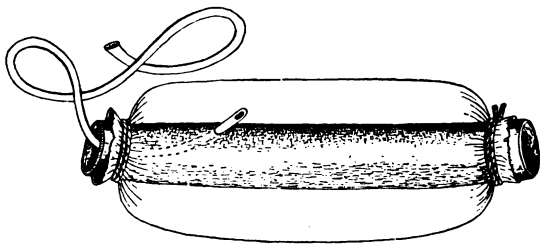


Fig. 25.—Combination drain and hemostat for liver abscess.

wounds of such organs the most furious type of venous hemorrhage ever encountered, and unless checked immediately it will exsanguinate the patient in a few moments. To meet this emergency a combination drain and hemostat was devised as follows: (See Fig. 25) A small, firm, red rubber catheter is passed through the wall of the large rubber drain from its lumen outward, leaving the end within the double thickness of condon which forms the bag. To avoid occlusion of the catheter from constriction by the puncture, it may be necessary to take away a bit of the rubber where punctured or to burn a hole that will be small enough to hold the catheter firmly without obstructing it and at the same time snugly

enough to prevent the escape of the air. This apparatus might also be used to advantage instead of gauze for wounds after excisions of a portion of the surface of the liver, after the idea of Kousnetzoff and Penski, who,

Fig. 26.—Combination drain and hemostat inflated in a liver abscess specimen. For better view of improved apparatus, see Fig. 25. (Author's collection.)

in 1894, recommended a continuous suture over gauze packing for such wounds. Fig. 26 shows another but inferior type of apparatus distended in a liver abscess specimen. The advantages of this simple and always available arrangement are that it acts at the same time

as a drain and as a hemostat; it can be inserted and inflated in a few seconds; it produces efficient, uniform and equable pressure upon all parts of the irregular bleeding surfaces of any tunnel made through the liver substance either to open an abscess or for a trauma from any other cause. The pressure can be regulated as required, can be

Fig. 27.—Liver. Roundworm invasion through large common duct, showing small abscesses. Case 1 of Dr. Vernon L. Andrews, not reported.

easily renewed in case of leakage of the air or another apparatus can be quickly substituted in case of rupture of the balloon. It is easily removed by traction on the drainage tube, after cutting the outside silk ligature which inverts the bag from within outward. In one case the Kelly proctoscope through which a long, wide, dou-

bled gauze bandage was packed, controlled an alarming hemorrhage.

"In the examination of liver abscess pus for Entameba histolytica, the pus first obtained after the operation usually does not contain entamebæ; frequently they appear in the pus from the drainage tube only after several days. The explanation of this is to be found in the fact that the entamebæ are not found in the pus of the abscess,

Fig. 28.—Liver. Roundworm invasion through large common duct, showing small abscesses. Case 2 of Dr. Vernon L. Andrews, not reported.

but only in the tissues at the walls of the abscess. Consequently, it is only when the walls of the abscess begin to slough off that the entamebæ appear in the drainage from the abscess. Therefore, a negative diagnosis of entamebic liver abscess should never be made except after negative examinations obtained for several successive days after operation." (Walker.)

Occasionally round worms will find their way to the

liver when the common duct has become dilated; they have never been recognized during life, but have been discovered postmortem in a few cases. (See Figs. 27 and 28.) Flukes of several species have also been found occasionally.

For the most recent information on cosmopolitan hepatic conditions, reference is made to the article on "The Liver and its Cirrhoses," by Dr. William J. Mayo, in the *Journal of the American Medical Association,* May 11, 1918.

CHAPTER V

GYNECOLOGY AND OBSTETRICS

About fifty per cent of all surgical cases encountered among the natives of the Philippines belong to so-called gynecology. The varieties of pathology found and the causes of diseases peculiar to native women do not differ materially from those in America, not excepting hygienic conditions, general and local, although civilization, education, and social conditions so often a factor are supposed to be greatly inferior to those in the United States. It has not yet occurred to the natives that limitation of offspring is a good thing sometimes and, being religiously opposed to criminal abortion, it also has not become established as custom or as fashion. The very unhygienic conditions under which childbirth takes place and the ignorant, brutal, and meddlesome midwifery make for numerous lacerations of the birth canal and enough infection to bring up the average of pelvic inflammatory disease to perhaps more than that of their more civilized white sisters who are indebted to a greater extent to the gonococcus for these troubles. When labor is not accelerated by violent means, traumatism is slight, as the babies' heads are small and infections are infrequent.

A tight cord is often worn about the waist "to keep the child small;" this almost cuts the body of the mother in two at times; a woman must work hard during pregnancy; the native midwife makes frequent examinations for five cents each and "changes the baby around;" the superstitions of the very ignorant are of the most terrifying nature; the mother rarely knows when the baby is coming and is seldom prepared for it; during labor she is kneeled on, squeezed, and rammed by wooden or stone clubs which

are sold for the purpose in the markets; during parturition a rope is looped around the body above the uterus "to keep the child from going up" and the ends are pulled on

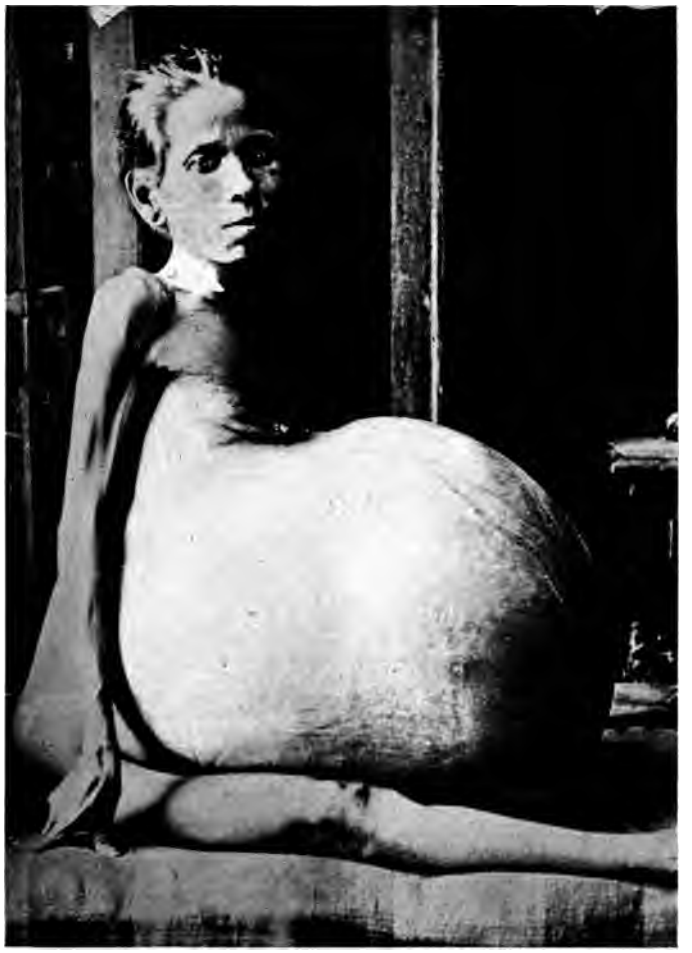


Fig. 29.—Ovarian cysts. (Photograph by Dr. R. H. Castor, of Swebo, Burma.)

so strongly by two men that, in one case I saw, the ribs on both sides were fractured; the placenta is pulled away by the cord, or if it does not come in about an hour, the

cord is cut short. The placenta when burned with paper and pen under the house assures an "illustrious" child and a placental soup for the mother prevents all complications. The tight rope about the body is kept snug during labor "to prevent the breath and blood mixing together;" a band is cinched up about the pelvis by strong men to keep her from falling apart; bleeding is encouraged by making the patient sit up; she is stuffed with food and under no circumstances is she allowed to sleep for three days or she will become, "loca," (insane); the

Fig. 30.—A six months' abdominal lithopedion, carried seven years: a second and smaller one was found in the pelvis. (Author's collection.)

uterus is then "put back" and smoked over an herb fire to dry up its rawness and for three months she can not take a cool bath.

The baby comes in for his share of attention also, as may be believed from the statistics which show a mortality of 65 per cent in infants under one year of age. These were the obstetric customs in the province in which I was stationed in the early days of American occupation, but they are being rapidly changed through educated native medical men and nurses as the Filipinos are very quick to learn and to appreciate improvements.

Tuberculosis and malignant affections, dermoid and every variety of ovarian cyst are common and as surgery in the provinces is not often resorted to, some extreme cases are seen (Fig. 29). Among the curiosities encountered was a double lithopedion in a woman thirty-six years of age which was carried seven years; the abdominal specimen, a six months' child, was swung high up in the omentum and draped about with many coils of small intestines (Fig. 30); the pelvic specimen in the right tube was 8 cm. (3¼ inches) long by 3.5 cm. (1½ inches) through; each was a firm stony mass except where some adipocere and mummification occurred. Fibroids are common in all parts of the uterus; probably over twenty per cent of native women have fibroids, but less than five per cent of these have symptoms or apply for treatment. The patients are very tractable and react from the most extensive operations very satisfactorily.

CHAPTER VI

GENITOURINARY

In the Philippines, vesical and renal calculi were very common but prostatic hypertrophy was never observed. Venereal disease was not common, but cancer of the penis was rather frequent. I reported amebic infection of the urinary bladder, without rectovesical fistula, in 1904; the source of the infection was traced to the use of an unclean catheter which was employed in irrigating the bowel of other patients for entamebic dysentery; when the patient entered the hospital for pain in the lumbar region, the urine was normal; after daily irrigations for ten days and one exploration for stone on the seventh day, he complained of dysuria, hematuria and severe pain at the end of micturition; large motile amebas were found in his urine; amebas were positive for a month; there were no amebas in his stools; a daily irrigation with 1:500 up to 1:100 solution of quinine, five to six ounces of which could be retained from two to five hours, cured the condition. Lynn of Costa Rica also reported a case (1914) infected by a syringe previously used in the rectum and six cases were said to have occurred in the military base hospital in Manila (1900-1904) but the data could not be found of record.

TROPICAL FISTULÆ IN ANO

Maxwell,[1] of Formosa (1912), reports multiple deep fistulous tracks of the buttocks which are not common; two or three cases a year occurred in 8,000 cases. It commences as a fistulo-in-ano; as it is painless the cases are neglected and become very extensive; some are of

[1]Maxwell, J. L.: Trans. Soc. Trop. Med. and Hyg., 1912, vi, No. 2, p. 50.

five years' duration; incision and curettage do not help and excision is impracticable on account of the extent of the disease; they were not tuberculous and no fungi could be detected, but large amebas were found in every case. Ulcers of the rectum, perirectal abscess and fistulæ due to amebas were common in the Philippines in the early days but no such condition as Maxwell describes was observed. Kartulis described a similar condition in Egypt due to a blastomycosis of the gluteal region, later observed by Castellani in Ceylon, in which a saccaromyces-like organism was found; he claimed that the sinuses did not communicate with the intestines. In Maxwell's cases the amebas may have wandered in from the bowel.

CHAPTER VII

CATASTROPHE AND EMERGENCY SURGERY

Emergency surgery included many and extensive incised wounds due to the fiery temper of the native and his fondness for the bolo and dagger in settling disputes.

The eruption of Taal volcano, forty miles south of Manila, on January 30, 1911, at half past two in the morning, furnished the most extensive experience in catastrophe work since the American occupation of the Islands. Fifteen hundred people were killed and several hundred burned; about two hundred of the worst cases were brought to the hospital in Manila several days later. The burns were of every degree of the exposed parts of the body and nearly all were infected; the pain complained of was not excessive and slow recovery under picric acid dressings was the rule. Some of the patients at a distance from the volcano described their burns as due to a rain of mud that was not hot but seemed to contain some escharotic; others near the volcano attributed their burns to the force of a blast of hot wind filled with hot sand and ashes that lasted ten or fifteen minutes, followed by a shower of ashes, a deluge of hot mud and lava and later by a downfall of rain. Many other injuries besides burns occurred; one of the hospital cases seen was as follows: The house of Señora Apolonia Solis, on the banks of Taal Lake, was swept into the water and she, carrying a child at term, while swimming, was deeply cut on the head and groin by a flying piece of metal roof; her baby was born that morning; her wounds healed nicely later and mother and child survived.

Another wholesale prostration of people occurred one Sunday after the masses celebrating Saint John's day,

when it was the custom to bathe in the sea. The beach was crowded with natives writhing in agony from the effects of jelly fish poisoning. Some of them were paralyzed by the poison and may have died; all suffered intensely; the superficial effects on the skin of some white persons whose feet and legs only came in contact with the jelly fish masses, were an intense burning and reddening; the general symptoms which were alarming were heart failure, a complete loss of strength, and nausea. Treatment was morphine, diffusible stimulants, soap and fresh water cleansing, and soothing applications to the skin. Stitt called attention to the fact that these fish must possess various degrees of venom and cited the case of a powerful American naval employee who dived overboard to refresh himself and was killed instantly. The other principal under-water danger to man is sharks.

Some of the military surgery of which a great deal was handled during the campaigns of 1898-1902 was unusual and interesting on account of the native weapons, and might properly be classed as emergency surgery. Gas gangrene and tetanus were not uncommon either among soldiers or in civil life.

Snake bites are not a feature of Philippine accidents, as the principal venomous varieties although represented are neither numerous nor active. The pythons which kill by constriction grow to over 30 feet in length, are terrifying to contemplate but are sluggish; this lethargy, however, is not always shared by beholders. I saw a squad of five soldiers do a half mile in two minutes flat over bad ground, immediately after having slid down a river bank almost on top of a monstrous old serpent coiled up in the sun in the dry bed of the stream, probably digesting his last month's meal; as soon as they could overcome their momentum they went back and got him. Young pythons, six or seven feet long,

used to be vended by native boys as ratters, for about five dollars Mexican; placed in the attic of a house which seems to be his town domicile of choice, he forages for himself and keeps the premises rat-free. The only evidence of his presence will be an occasional racket when in combat with an intruding cat or a wet spot which shows on the ceiling if of bamboo matting. When it is bad hunting indoors, he is apt to fare forth at night and rob the hen roost; he may even find an affinity and furnish unwelcome additions to the family, but the worst thing he does is to lie down and die between walls and pollute the air most tremendously. House snakes were not popular with Americans, especially not with women who had babies, and there was small demand for them. Their power of constriction is very great. In the early days of military occupation a small boy carrying a six foot snake wound around his body was exhibiting him to some officers, in front of the Oriente Hotel in Manila. The officers annoyed the reptile so much by prodding him with their sticks that he closed down on the lad and crushed him so severely that, it was said, he died later. Awakened one night during a typhoon by crashing glass and falling objects I arose and slew an eight foot specimen, glittering and beautiful in a brand-new coat, in my bedroom, where he had lost his way on his reascent to the roof.

There are no dangerous wild beasts except the wild carabao or water buffalo, which when hostile has no match for ferocity; one must either kill him or take to a tree, and that forthwith, or be killed, for, although weighing about a ton, he is as quick as a tiger. Otherwise the country is a hunter's paradise, swarming with game of all sorts. Heat prostration in the Philippines is practically unknown. Leeches work through any footwear except boots. The bleeding from their bites is very persistent and can be stopped only by continuous pressure.

CHAPTER VIII

FILARIASIS

The filaria nematodes, excepting the malarial plasmodia and amebas, are the most widely distributed parasites of the torrid zone, and are also found occasionally in the United States and Europe. Certain mosquitos which act as the intermediate hosts for the filarial diseases of surgical importance were experimentally determined by Manson, Bancroft, and others. The embryo nematodes of Filaria bancrofti in the blood of the human host are taken in by the various species of Culex and Anopheles, and undergo in these insects the changes necessary for reinoculating man during a subsequent feeding; consequently, it is of the greatest importance whenever a case is discovered to protect the mosquitos against infection by screening off the parasitized person. The innumerable embryos in the peripheral circulation are never the pathogenic agents of so-called filarial conditions. (Figs. 31, 32 and 33.)

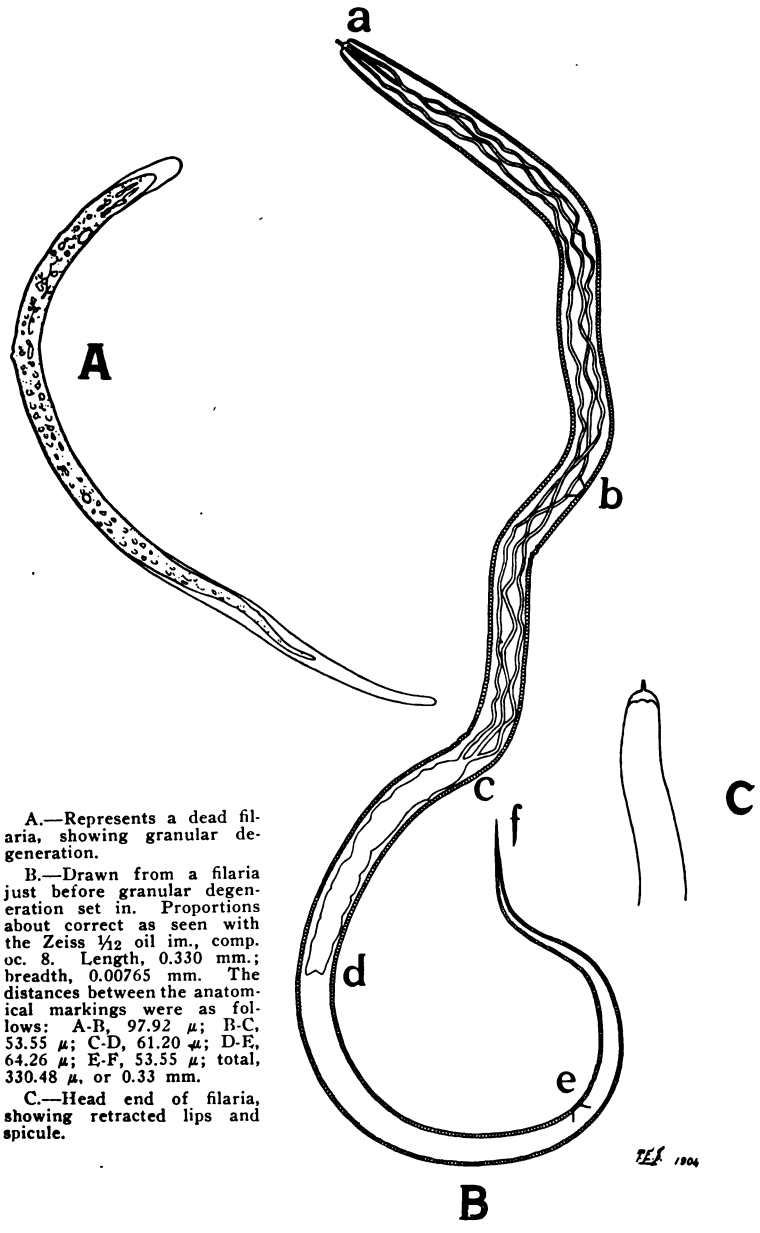
Captain Phalen and Lieut. Nichols[1] of the United States Army Tropical Board in 1908-1909, made about 7,400 blood examinations in various localities of the Philippines to get an idea of the prevalence and distribution of filaria, and found it to represent two per cent of infections for the islands; thirty-five cases had elephantoid disease. Protection from mosquitos is preventive but this is impracticable for a native population, hence whenever a case is discovered among the native employees of foreigners, it should be discharged at once as the Culex fatigans Wied., which transmits the disease, is omnipresent.

[1]Phalen, Jos. M., and Nichols, Henry J.: Philippine Jour. Sc., 1908, Sec. B, iii, 305; 1909, Sec. B, 127.

Fig. 31.—Filaria nocturna, × about 390 (double exposure). Showing the general morphology and the viscus-like organ at the junction of the middle and posterior thirds of the parasite (Wherry and McDill).* (Photomicrograph by Charles Martin, Manila, photographer, Bureau of Government Laboratories.)

Fig. 32.—Head end of Filaria nocturna, × about 880. The sheath, the three duct-like threads connecting the anterior end of the viscus-like organ with the head end of the embryo, and the transverse striations of the musculo-cutaneous layer may be seen (Wherry and McDill).* (Photomicrograph by Charles Martin, Manila, photographer, Bureau of Government Laboratories.)

*Reprinted from Jour. Infect. Dis., June 24, 1905, vol. ii, No. 3, pp. 412-420.



A.—Represents a dead filaria, showing granular degeneration.

B.—Drawn from a filaria just before granular degeneration set in. Proportions about correct as seen with the Zeiss 1/12 oil im., comp. oc. 8. Length, 0.330 mm.; breadth, 0.00765 mm. The distances between the anatomical markings were as follows: A-B, 97.92 μ; B-C, 53.55 μ; C-D, 61.20 μ; D-E, 64.26 μ; E-F, 53.55 μ; total, 330.48 μ, or 0.33 mm.

C.—Head end of filaria, showing retracted lips and spicule.

Fig. 33.—Filaria nocturna. (Wherry and McDill*—Figures redrawn by T. Espinosa from original drawings.)

*Reprinted from Jour. Infect. Dis., June 24, 1905, vol. ii, No. 3, pp. 412-420.

Medical Treatment.—Many drugs have been employed empirically without success. The most promising internal treatment, aimed at the death of the parent worm, is the new arsenical antiluetic preparations, arsenobenzol, "606," and anilarsenate of sodium, "Atoxyl," of which 10 to 15 drops of a 10 per cent watery solution is given hypodermically every day or every other day for six weeks. Failure of the embryos to reappear in the blood after one and two years, following such arsenical treatment, can be taken as presumptive evidence that the parent worm has been destroyed; if further experience shows this treatment to be effective, an early destruction of the parasites will prevent the development of the hopeless conditions now found in chronic cases.

Clapier (Les porteurs de Kystes filariens (Onchocerca volulus et de Nodosités Juxta-Articulaires en pays Toma (Region militaire de la Guinée), *Bull. Soc. Path. Exot.*, February, 1917, vol. X, No. 2, pp. 150-157) describes a common subcutaneous cystic tumor in the Toma country which separates Liberia from the rest of French Guinea. They are of slow growth, vary in size from a shot to a small orange, very firm, rounded, generally multiple, not painful to pressure—or slightly, slight tendency to suppuration. These signs are common to both the juxta-articular and the volvulus cysts; the juxta-articular, however, are very firm or hard, neighboring tissues puffy, less regular in contour, prefer to localize on bony epiphyses, have a definite tendency to symmetry (see Figs. 65 and 66) and are often adherent to the periosteum, whereas the volvulus cysts are elastic, regular in shape, neighboring tissues not puffy, not clearly connected with bones or joints but localized in inguinal fold, pubes, ribs and scapula. There is little tendency to symmetry and they are generally movable. Exploratory puncture will confirm the diagnosis; in the nodules there is no fluid, in the cysts is a thick viscous, grayish, yellow

or orange fluid rich in microfilariae; the cyst cavities are partly filled with tangled threads attached to the walls; these are the adult worms; the females are connected with the walls, the males are free. The nodules are white on section and fibrous and there is no cavity. Juxta-articular nodules appear to have more than one origin, a nocardia (Madagascar) and in Nyasaland, yaws.

Elephantiasis

The specific factors are perhaps rarely the parent worms of filaria, although five and six worms have been found blocking the lymphatics (Castellani); usually some undetermined microbial causes exciting an obliterative inflammation or secondary and frequent invasions of the deeper parts by the skin diplococcus and other pathogenic organisms are the actual causes of chronic obstruction of the lymphatic and venous circulations of any blocked off area; these with the resulting characteristic fibromatosis changes in the hypoderm produce what we call elephantiasis. The following case is typical of so-called beginning cases and strongly suggests streptococcus infection.

American, thirty-three years old, resident of the Philippines ten years, married to a native woman; in 1906 he began to have attacks of chills and ten day fever with pain every two or three months in the right lower extremity beginning in the foot, which became swollen, hot and tender; this case suggested clinically nothing so much as a chronic submerged erysipelas, according to Sabouraud, Unna, and others. In 1911 the increasing size of the limb brought him to the hospital. Numerous attempts to find embryos in the blood at night or in the tissues of the swollen limb failed. After rest in bed and bandaging for two weeks the skin became elastic; long double No. 14 silk was looped subcutaneously from over

the instep in front to the inguinal and hypogastric regions above, and another loop was passed behind from

Fig. 34.—Beginning elephantiasis in an American in Manila. (Author's collection.)

just above the heel to the region of the buttocks into healthy subcutaneous spaces, according to Handley's[2]

[2]Handley, W. Sampson: Hunterian Lectures, Brit. Med. Jour., 1910.

method of lymphangioplasty. The improvement after six months was not so apparent as in the weeks immediately following the operation, but the patient claimed that he was much more comfortable (Fig. 34). In the true chronic elephantiasic condition or elephantiasis nostras streptogenes there is no fever, the skin is hard and verrucose and the overgrowth in some cases is enormous (Fig. 35).

Fig. 35.—Chronic elephantiasis nostras streptogenes of scrotum and leg. (Deschien's Atlas.)

The prominent clinical feature is lymphatic and venous obstruction with lymphedema; numerous surgical procedures have been attempted for its relief. Limited excision has been unsatisfactory. Sir Havelock Charles removed the diseased tissue entire from the foot to knee and skin-grafted the surface with a good result. Castellani[3] claims good results in selected cases by complete three to six

[3]Castellani: Brit. Med. Jour., 1908, ii, 1361.

months' rest lying down, firm equable continuous pressure by very carefully applied bandages and daily injec-

Fig. 36.—A case of neurofibromatosis in a woman thirty years old resembling elephantiasis. "Elephantiasis Nervorum." (Unpublished photo from Dr. R. H. Castor, of Swebo, Burma.)

tions deep into the affected parts of 2 to 4 c.c., in water of "fibrolysin" which is a mixture of thiosinamin and

salicylic acid. This treatment renders the skin clean, loose, and flexible, so that long strips can be resected aseptically. Elastic support must be worn to prevent relapse. When the parts attain enormous size, there is nothing to offer but amputation. Matas[4] (1913) in reviewing the treatment of elephantiasis, reminds us of the failure of ligation of the main artery advocated by Carnochan in 1851 and of the more recent multiple cuneiform excisions of skin and underlying fibromatous tissue by Kuznetzoff (1905) and others, with favorable results in a certain number of cases. Handley's silk-lymphangioplasty has not given good results after extensive trial by many surgeons. Le Nourmant pointed out that no matter how ancient or aggravated elephantiasic states may be, the tissue lesions are limited by the derm and hypoderm and do not extend below the deep aponeurosis where the tissues retain their normal circulation and are capable of taking care of the stagnant lymph above the aponeurotic partition, provided an opening is established between them.

Lanz[5] of Amsterdam in 1906, improved on Handley's method by the formation of communications of subcutaneous and deep muscular and periosteal lymph channels to within the bone; he fenestrated the fascia lata, trephined the femur and passed flaps of the fascia down through the muscles and into the medullary canal, with excellent results. Oppel, of St. Petersburg, extended this method to the tibial and crural points without opening the bone. Rosanow,[6] of Moscow, shows by a case in which he obtained a good and an apparently lasting result, that deep triangular and rhomboid flaps of fascia tucked between underlying muscles may bring about a drainage and cure of elephantiasis; Kondeleon[7] (1912) removes large sec-

[4]Matas, R.: Surgical Treatment of Elephantiasis, Am. Jour. Trop. Dis., July, 1913, 60.

[5]Lanz, O.: Zentralbl. f. Chir., Jan. 7, 1911, 3.

[6]Rosanow: Lymphangioplasty in Elephantiasis, Arch. f. Clin. Chir., 1912, xcix.

[7]Kondeleon: München. med. Wchnschr., Dec. 10, 1912, 26.

tions of the fascia lata in the thigh and leg, claiming that permanent new anastomotic channels are formed between the lymph spaces above and below the site of the removed aponeurosis and his six cases in Athens support his contention. Matas,[4] and Gessner, each made a limited Kondeleon operation on one case with marked improvement. The possibilities of repeated injections of antistreptococcal polyvalent serum which gave such satisfaction in one of Matas' cases should not be forgotten, nor the autogenous vaccines made from the mycotic invaders of the deeper tissues. Charles,[8] in India, has successfully operated upon several hundred cases of scrotal elephantiasis by complete ablation of all diseased skin and tissue, carefully preserving the return circulation of the penis; he then covers the denuded parts and testicles to the base of the penis by sliding adjacent healthy skin; the penis is covered by Thiersch grafts. His mortality was one per cent.

Chylous Ascites, Chylothorax, and Chylocele

These are not common conditions, but are occasionally recognized by the presence within the peritoneal, pleural or tunica vaginalis testis sacs of a milky fluid, which, if chyle, represents some injury to the large lymph vessels; if the chyliform fluid contains only degenerated epithelium fat and pus cells, it is usually an exudate from a concealed cancer or tuberculosis. The surgical treatment of true chylous collections, if the lesion in the vessel does not close spontaneously under watchful waiting, is that of other effusions into these cavities; a chylocele can be overcome by any of the methods devised for the cure of hydrocele; a chylothorax, if persistent and due to loss of absorptive power of the pleura or failure of the lymph vessel lesion to close, will require some modi-

[8]Charles, R. H.: Indian Med. Gaz., 1901, xxxvi, 84.

fications of Handley's and Kondeleon's operations. Ascites of the peritoneal sac when there is no physiologic objection to draining it back into the general circulation, is often manageable by an epiplopexy devised by Talma, Drummond and Morrison (1896) or by several other procedures originated since, but the average death rate of these procedures has been about 20 per cent. Schiassi fixes the spleen and omentum in a recess of the abdominal wall. Mayo places the omentum anterior to the posterior sheath of the rectus by burrowing between two incisions, one over the liver and one 10 cm. (4 inches) lower.

Narath's method is very popular. Under local anesthesia the fluid is let out through an incision above the umbilicus; a thumb sized, 10 cm. (4 inch) long piece of omentum is drawn out, avoiding tension on the colon; the peritoneum is sutured around the base of the piece of omentum and the rest of it is placed in a subcutaneous pocket to the left. There is nothing to prove the theory that the good results after these operations are from collateral circulations, while there is much to show that the fluid finds its way directly to the subcutaneous spaces alongside the herniated organs where they have produced a defect in the abdominal wall, which opens under pressure. Eck's fistula between the portal vein and the inferior vena cava is not only difficult but when accomplished has been followed by alimentary intoxication and death. Gall bladder drainage is indicated in the obstructive billiary type of toxic cirrhosis with ascites; this type has been produced experimentally many times.

Wynter tried femoral canal drainage, operating through a trocar wound after tapping, but it was difficult and tedious, a general anesthetic was required, the opening was liable to be blocked at any time by omentum or intestine, or it would be sealed by reparative processes. Wynter also planted a flanged silver eyelet with a 7 mm.

(¼ inch) wide opening subcutaneously in the linea alba, but it and other devices of this type proved failures.

Henschen,[9] after two efforts to provide drainage for ascites in a stomach cancer case, made a tunnel from an incision above the left spine of the ilium through the abdominal wall to a median incision opening into the peritoneal cavity; the mouth of an ordinary rubber condom was then sutured to the opening in the peritoneum, the condom was drawn through the tunnel and the blind end cut off, leaving it projecting the width of a thumb above the plane of the externus aponeurosis; this end was then spread out into a ring and sutured to the aponeurosis, and the skin was closed. The immediate result was an extensive edema around to the middle of the back, the ascites was kept down, and the pressure disturbances of the heart and lungs subsided entirely. If the omentum is sutured out of the way, the drainage might persist in this operation but the hernia liability must be considerable.

Döbbertin,[10] under local anesthesia, ligates, divides, and turns up about 5 cm. (2 inches) of the saphenous vein below Poupart's ligament, passes it upward under the ligament and out through a second incision just above it; a cuff of peritoneum is brought up between the external abdominal ring and the edge of the rectus and into it is sutured the end of the vein; the opening through the abdominal wall was made by splitting and is sutured open to prevent constriction of the vein. Döbbertin found that the blood from the vein did not escape into the peritoneum; he claims that the operation is simple and harmless, and adds that it may become necessary to repeat the operation on the other side later. Although this procedure returns to the blood by the most direct route, the fluid which originally came from the blood, there are

[9] Henschen: Zentralbl. f. Chir., Jan. 11, 1913.

[10] Döbbertin: Die directe Daurdrainage des chronischen Ascites durch de Vena saphena in die Blutbahn, Arch. f. Clin. Chir., 1913, No. 4.

secondary changes at times in the peritoneal fluid on account of which it might be better to return it to the systemic circulation by an indirect path or through the lymphatics.

De Lambotte[11] (1905) of Antwerp was the first to use silk to drain the abdomen; he tied a large knot 6.5 cm. (2½ inches) from one end of a thick silk thread 54 cm. (18 inches) long, put the knotted end in the peritoneal cavity and the rest of the silk under the skin of the thigh; marked edema appeared the fourth day in the thigh but soon ceased because the intraperitoneal end became embedded. Of the ascites cases reported by this method the most instructive and suggestive in many ways was one of Handley's. Until five to seven months after the operation no proof was evident of drainage along the silks in the thigh, when the edema appeared simultaneously with a crop of gummata; no specific treatment was given until nine months after the operation.

In 1913, by a series of experiments, I[12] attempted to show that the relief of ascites after operations which herniate an abdominal organ, or which implant silks from the peritoneal cavity to the subcutaneous spaces, is probably not from collateral circulations in the one case, or from capillary drainage in the other, but is due to leakage of the fluid through the space alongside the marsupialized organ or the implanted silks, which are prevented from uniting to the surrounding tissues firmly enough to hold in water under pressure, not only by this pressure itself, but also by the normal and constant movements of the abdominal wall. The chronic ascites patient pays too dearly for relief by tapping off large quantities of fluid, rich in proteins, salts, and the characteristic constituents of the tissues and fluids of the

[11]De Lambotte: Samaine méd., 1905, 19.

[12]McDill, J. R.: Chronic Ascites: Treatment and Drainage by Lymphangioplasty through a Trocar Wound under Local Anesthesia: An Experimental Study, Surg., Gynec. and Obst., 1913, xvii, 523.

body which are necessary to metabolism, if this transudate can be restored to the circulation by a simple operation. My experiments show that the ends of three strands of No. 20 silk, sewed together and slightly projecting into the lower levels of the peritoneal cavity, become a permanent silk-connective-tissue peg; that the breach it makes in the abdominal wall allows the escape of fluid, and that the hernia and adhesion liability is nil. In thirty days the intraperitoneal end was found to have become converted into a connective tissue and silk peg covered with a dense membrane making it impossible as a capillary drain; around this peg the peritoneum was puckered and everted (Fig. 37) and not strongly attached to the silk.

The instruments can be made from old tools found in any doctor's office (Fig. 38). The Kelly tube with trocar and the Pean forceps are not essential; use any cannula that will take the "carrier" when loaded with the silk. The technic consists in (1) paracentesis just above the pubis and 5 cm. (2 inches) from the median line; be sure the cannula is in, because on account of the recumbent position of the patient very little fluid will flow; (2) pass the silks (Fig. 39) through the cannula until about 2.5 cm. (1 inch) project beyond the parietal peritoneum; hold it exactly there, slip the cannula out over the "carrier" and thrust each of the three ends which have been cut to the desired length, using the bodkin eye first, downward and in three directions into the subcutaneous fat; (3) remove the "carrier" and without disturbing the silk ends in the peritoneal cavity, tuck in the bends of the silks and suture the skin opening very snugly. When these special instruments are not available, the silk can be planted through a short incision under local anesthesia, with one stitch to anchor it to the deep fascia; also after an exploration, when it is indicated, the silk can be easily inserted to one or both sides of the wound before closing the abdomen.

Fig. 37.—The silk is covered with a dense membrane and at the angle with parietal peritoneum shows a marked ectropion of the peritoneum. (Author's collection.)

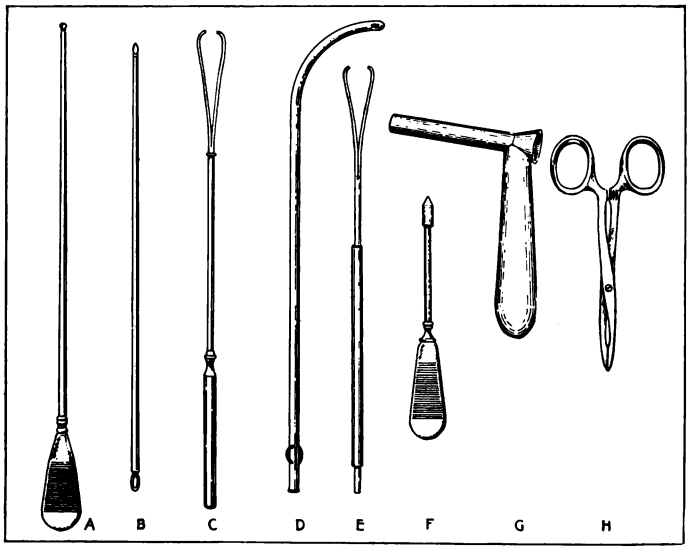


Fig. 38.—*A*, Sim's uterine sound; *B*, same with handle removed, blunt end perforated and probe pointed, making the "Bodkin;" *C*, 25-cm. (10-inch) Emmet's cotton carrier; *D*, No. 14 standard gauge catheter; *E*, the "silk carrier," made from *C* and *D*; *F*, trocar for the Kelly endoscopic tube; *G*, used as cannula; *H*, Péan forceps. (Author's collection.)

Fig. 39.—The three pieces of No. 20 silk with about 4 cm. (1½ inches) of their ends stitched firmly together with fine silk, held in the silk carrier ready for insertion through the cannula. (Author's collection.)

Conclusions

1. Ascites patients have an impaired vital resistance, deficient powers of repair, and do not stand extensive operations well under a general anesthesia.

2. The operation is not much more serious than a simple paracentesis and other silks can be inserted at any subsequent tapping until there is sufficient drainage; pressure by intraperitoneal fluid is desirable after this operation to weaken the line of union between the silk and the surrounding tissues, but if it becomes too distressing, a tapping may be necessary to give temporary relief, on which occasion more silks may be inserted: permanent drainage may not become established until two or three months.

3. The permanency of any improvement will depend upon the correction of an intestinal toxemia when present, rest in bed when indicated, total withdrawal of alcohol, a bland and almost salt-free diet, and attention to any cardiovascularrenal disturbances. Several good results have been reported in favorable cases; that is, in those in which the effusion was chronic and aseptic.

Lymph Varix and Lymph Varicose Glands

Although lymph varix and lymph varicose glands may occur anywhere in the body, the varix is usually associated with chylocele and lymph scrotum and the varicose glands are found in the groins and both can occur in the same patient who may also show a chyluria. The beginnings of these conditions are usually painless and attention may be first called to them by their size or by an inflammatory attack; to the superficial observer, the groin glands may resemble hernia; they are a tangle of varicose lymphatics usually connected with pelvic and abdominal vessels; the hypodermic needle will show the characteristic fluid which often contains filarial embryos.

If they become very troublesome, removal can be recommended, but the patient should understand that a sepsis may be fatal, lymphorrhagia may follow or other neighboring areas may become implicated and cause an elephantiasis.

Hematochyluria

This condition is due to a rupture of a lymph varix into any part of the genitourinary tract. It is usually discovered accidentally, although pain in the back and groins may precede it. Often retention from blocking of the meatus internus by a coagulum is the first symptom. The diagnosis is unmistakable as soon as the milky or peach colored urine appears and the microscope reveals, in a large proportion of cases, the dead embryos of filaria. The chyluria comes and goes according to the patent or shut condition of the opening from the varix. It is very chronic and the patient becomes extremely anemic and debilitated. Treatment, except that directed at destruction of the parent worms by arsenical preparations, noted above, is of no value. Wherry and McDill in Manila in 1904 treated a Japanese girl for this disease by x-rays after cinchonizing her with quinine; the embryos disappeared completely from the blood; after recovering from a moderate x-ray burn, causing also a left pleurisy, she recovered and was in perfect health four years later. Wellman and Adelung[13] reported a success after this method but the condition relapsed later.

Bilharzia Hematobia (Distomum Hematobium)

This is another and frequent cause of hematuria principally among the natives of Egypt and seems limited to Africa; its most characteristic symptom is a variable amount of pure blood at the end of micturition caused by the presence of the parasite in the wall of the bladder;

[13]Wellman and Adelung: Jour. Amer. Med. Assn., April 23, 1910, p. 1368.

large numbers of the spined ova are always found in the urinary sediment. It is often complicated by filarial infection which may contribute chyle to the urine. The transactions of the German Urological Congress of 1912 cite records showing that the old Egyptians, 1200 B. C., wore a sort of condom to prevent the contraction of bilharzia disease. According to all authors recovery is infrequent and curative treatment is futile.

Robertson[14] (1914) used what he calls "thymo-benzol" for several months as a bilharzia toxin and reports that even in the worse cases all symptoms and signs of the infection disappear, although an egg or two may be found after prolonged search in some cases which are apparently well. He noted that hemorrhage ceases, all ureteral, vesical and urethral pain vanishes, and in two or three days after treatment the ova come away mostly stained black but all dead, as none of them hatched out; the detritus of bilharzia also disappears and the exudate in the urine passes away almost entirely on boiling. Robertson holds that the helminth toxins cause the headache, backache, sweating, frequent micturition, giddiness, pallor and emaciation and, that as the remedy removes them all, "thymo-benzol" is toxic to the worms themselves. His prescription is three grains of thymol in ninety grains of benzol every four hours for three or four days and urotropin administered in the intervals.

Ekins[15] tried this treatment on four cases in Alexandria; they were not benefited by the drug, on the contrary, he feels that it may be harmful and he found that the intoxicating effect, which lasted several days, was a great nuisance as the patients had to be held in their beds. Further experimentation may show where the technic of these two men is at fault.

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[14]Robertson, William: Thymol-Benzol in Bilharziasis, Tr. Soc. Trop. Med. and Hyg., Nov., 1914, viii, No. 1.

[15]Ekins, C. M., Director, Alexandria Hospital, Egypt: Tr. Soc. Trop. Med. and Hyg., June, 1915, viii, No. 7.

Dracunculus Medinensis, Dracontiasis, Guinea Worm, or the Worm of Pharaoh, Etc.

This is one of the most ancient and widespread of tropic diseases and is also occasionally found in the lower animals. It is believed to have been "the plague of fiery serpents" complained of by the Israelites in the Desert. The intermediate hosts according to the experiments of Feschenko, confirmed by Manson in Turkestan, are certian fresh water cylops; the embryo nematodes in water gain the interior of the body cavity of the cyclops by penetrating its integument and there undergo a metamorphosis similar to F. nocturna in the mosquito. Leiper showed that very dilute hydrochloric acid on the infected cyclops releases the embryos; this is probably what occurs in the gastric juice of the human stomach when infected water is drunk. The female worm alone is known in the pathologic process in the human host. The full grown worm is slender, yellowish and round, averaging about 76 cm. (30 inches) in length and about 1 mm. ($\frac{1}{10}$ inch) in diameter. The worm after she matures from an embryo in the connective tissues of the trunk or limbs bores her way usually to the leg below the knee, and pierces the skin by a more or less intense inflammatory process, culminating in a localized swelling surmounted by a blister which opens in a few days, revealing a small circular erosion with a small opening at its center. Sometimes the head of the worm protrudes from the little hole. By douching the area with cold water a clear or milky fluid appears, or a fine translucent tube, supposed to be the uterus prolapsed through the mouth, protrudes for an inch or so, fills with an opaque material and ruptures; this fluid contains millions of embryo worms about $\frac{1}{30}$ inch long and $\frac{1}{1000}$ inch in diameter. If the bed of the worm becomes infected by pyogenic organisms, an abscess may result by which the worm is sloughed off; if

the process is aseptic, parturition progresses by the daily delivery of the contents of a couple of inches of the uterus, which section shrivels up so that in about a fortnight the worm emerges spontaneously or can be withdrawn readily and the canal heals. Sometimes the worm dies before maturity or if mature may fail to tunnel through the skin; in such events an abscess follows an infection or the worm becomes encysted as a hard subcutaneous symptomless cord.

Unskillful attempts at early removal often rupture the worm; the escape of the young into the subcutaneous tissues usually results in a disastrous toxic inflammation which with sepsis added may cause extensive necrosis, may last for weeks and leave some serious disability. The best treatment is to keep the opening clean, douche the parts with cold water, and otherwise let it alone, especially if it is near a joint; if readily accessible it can be excised. Emily[16] injected the body of the worm, when it protruded, with 1:1000 sublimate solution and found that twenty-four hours later extraction was usually easily effected; when the worm is not accessible at the opening, he found that a few drops of the solution at several places as near it as possible would kill it; then it will be absorbed or can be excised.

Filaria Loa or "Calabar Swellings"

This infection is most common in West Africa and is caused by filiform worms about 30 to 40 mm. (1⅛ to 1⅝ inch) long, the male being 25 per cent smaller; both sexes wander freely about in the subcutaneous tissues; when passing under thin skin and especially under the conjunctiva, they can be plainly seen. It is not yet known just what insect acts as the intermediate host. The F. diurna is suspected as the embryo of F. loa and as the disease

[16]Emily: Arch. de Med. Nav., June, 1874.

seems to be acquired only in "the bush" some form of biting flies will no doubt be found to be the intermediate host. The worm in its subcutaneous travels causes transient swellings, the "Calabar swellings," due to discharge of the embryos, which rarely call for treatment but when it traverses the subconjunctival tissues severe irritation may result; it can be removed through an incision. Emily's treatment by alcohol injections for the subcutaneous manifestations might be useful as in guinea worm.

CHAPTER IX

SURGICAL INFECTIONS

A FOURTH STAGE OF SYPHILIS (GANGOSA, YAWS, AND CHRONIC ULCERATIONS)

Gangosa

Gangosa, a Spanish word meaning "talking through the nose," most common among the natives of Guam, is a chronic destructive ulceration beginning in the fauces and extending to the hard palate, nose, and even to the face, neck, arms, and thorax. This disease, thought for a time to be peculiar to the Marianas, the Caroline and the Marshall Islands, is now being discovered throughout the Tropics generally. The physiognomy of some of the natives of the Philippines suggest the effects of the disease in a modified form. Kerr,[1] Odell,[2] and Garrison of the United States Navy, have told the first clear story of gangosa, a disease which has never been understoood and which has resisted treatment from earliest times to 1910. Senn referred to it as "the unknown disease."

Julius Rosenbaum, of Berlin, and Halle, in his "Geschichte der Lustseuche im Alterthume," quotes Dio Chrysostom, of the second century, who scores the inhabitants of the City of Tarsus for a widespread affliction which he attributed to their notorious sexual perversions and which seems to have been a disease similar to what we call gangosa. Referring to the "snoring and snorting" of the people of Tarsus he says: "However, not primary affections of the posteriors were the punishment of the Cinaedus, but secondary ones of the mouth and

[1]Kerr, W. M.: Gangosa, U. S. Nav. Med. Bull., April, 1913.
[2]Odell, H. E., Surgeon, U. S. Navy: Personal communication, Nov., 1911.

throat. First and foremost was the hoarseness of the voice, to which Martial alludes, when he makes the champion of the baths, the Cinaedus Charinus, speak with a weak, hoarse voice. It is surely worth mentioning and it is a thing no one can deny. I mean the noteworthy fact that a disease has attacked so many in this city. I can not, by heaven, express myself more clearly with decency. The grossest ignominy is brought down upon their native city by these sleepers by day, the drunken, the overfed, and such as have lain ill, and they ought, I say, to have been expelled from your borders as has been their fate everywhere else. For it is not now and then, or here and there, they are met with, but at all times and in all places in the city occasion may be found to threaten, scorn and deride them for these signs and sounds of shamelessness and lewdness the most scandalous. If a man passes in front of a house in which he catches the sound, he says, 'Of a surety there is a brothel there.' Now what shall be said of a city in which nothing but this tone of voice prevails universally so that no exception can be made of time or place whatever? What if, further, all men walk in this city with skirts upraised as if wading in a quagmire? Tell me what is the reason others nickname you 'hawks?' Well then! suppose a stranger from a distance judges from your voices what kind of men you are, what it is you do? You are not fit, I tell you, to be neatherds or shepherds. I wonder anyone would take you for descendents of the Argives, as you profess to be, or indeed for Greeks at all,—you who outdo the Phoenicians in lubricity. At any rate I do think it would behoove a man of any morality in such a city to close his ears with wax, far more than if he were sailing past the Syrens' shore. There he would run the risk of death, but here of foulest licence, of violation, of the vilest seduction. Once Ionic harmony was in vogue, or Doric, or yet the Phrygian and Lydian, now it is the music of Aradus

Fig. 40.—Gangosa cases in Guam with nasopharyngeal involvement. (Kerr: U. S. Navy Med. Bulletin.)

Fig. 41.—Group of gangosa cases in Guam, showing the results of nasopharyngeal involvement, gumma-like lesions of bone, and extensive ulceration of skin and underlying connective tissue. (Kerr: U. S. Navy Med. Bulletin.)

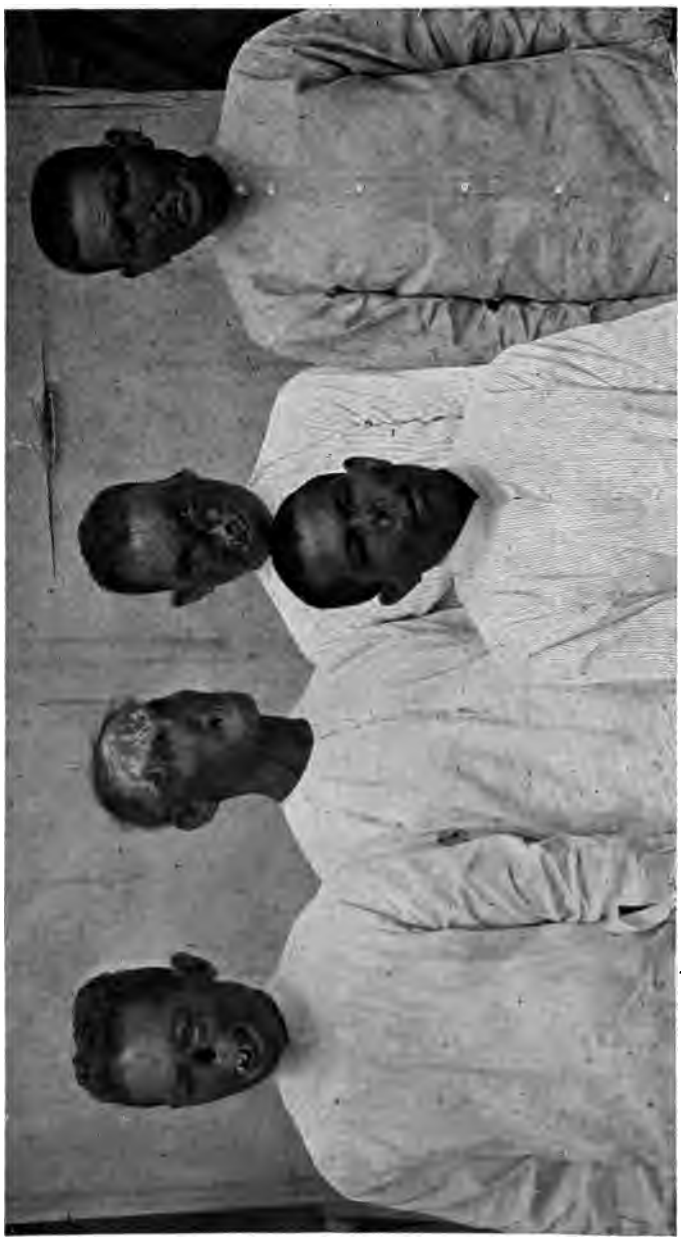


Fig. 42.—Group of gangosa cases showing marked disfigurement following nasopharyngeal lesions. Guam. (Kerr: U. S. Navy Med. Bulletin.)

and the Phoenician modes that please you. You love this rhythm *par excellence* as others do the Spondaic. Was ever a race of men that were good musicianers—through the nose? Know now that the gods in their anger have

Fig. 43.—Gangosa lesions. Guam. Noguchi negative. Lesions closed under mixed treatment. (U. S. Navy Med. Bulletin.)

played havoc with the noses of most of your fellow citizens, and that is why they have this voice of their own. But I say this thing is the mark of the most infamous lewdness, of the most infamous madness, of contempt for all decency and a proof of the fact that there is no more

any single thing held to be disgraceful. Their speech, their look, their gait proclaim it."

Gangosa is not fatal; the ulcerations are of the nasopharynx, derm and hypoderm; no visceral lesions are found; the upper lip is usually spared; the tongue and floor of the mouth are never affected. (Figs. 40, 41, and 42). The skin ulcerations which occur anywhere except

Fig. 44.—Extensive gangosa mutilation in a Filipina. (U. S. Navy Med. Bulletin.)

over the abdomen show two types; one, developing as a small nodule, or patch of nodules, softens and discharges at the apex through a small opening; the second and most common type has a sharply defined, raised, cyanotic margin with a necrotic base, a seropurulent discharge and may be very extensive, is not painful, heals very slowly, recurs often, and may be very disfiguring. The gumma-like lesions of bone, tendons, and subcutaneous tissues are

Fig. 45.—Gangosa. Age 17. Frambesia when 5 years. Ulcerations ten years; healed under mixed treatment. Complement-fixation test (Emery) positive. Noguchi positive. (Kerr: U. S. Navy Med. Bulletin.)

not so common and occur usually in the leg and leg bones. (Figs. 43, 44, and 45.)

There is still considerable to be done on the pathology. Gangosa has always been a puzzling disease until cleared up through therapeutic and serologic tests by the medical officers of the United States Navy. Early in 1910, Odell instituted the treatment which has eradicated the active manifestations of the disease and the secret of his success lay in enforcement by military order of antisyphilitic therapy; 338 cases were found among a population of 11,000; under a mixed treatment all active signs of the lesions ceased in about eight months and the few relapses were found to have evaded taking the medicine; this therapy was persisted in for two years when it was suspended for six months to observe tendencies to relapse. Salvarsan was received about the middle of 1912 and its effect on the new cases was very striking; it is now the prime factor in controlling the disease although it must be supplemented by a prolonged course of mixed treatment. No laboratory technic has revealed the presence of a treponema of any description and no cases of syphilis have ever been found to originate in Guam. Garrison says there are no tabes, paresis, hydrocephalus or syphilitic abortions in Guam and that in 150 autopsies he saw but two or three gummatous livers; but as the disease yields magically to antiluetic treatment, looks like nothing but syphilis, nine cases out of ten being near relatives to other typical cases, and as the scars are characteristic, it is perhaps a fourth stage of syphilis. After one year of treatment, one hundred cases showed a positive Wassermann test in 82 per cent, slightly positive in 3 per cent and negative in 15 per cent. Reactions on brothers and sisters were also positive although these blood relatives showed no gangosa; 83 per cent of 315 cases gave a positive history of yaws prior to the first symptom of the gangosa.

Frambesia, or Yaws

Frambesia or yaws is found everywhere under various names throughout the tropical world. Although very debilitating and repulsive in appearance, the disease is seldom fatal and is regarded by the races among whom it is prevalent as an inevitable disease of childhood. It also appears in a late or tertiary form among adults, usually of the face, causing in some cases flattening of the nose; another very chronic form is found on the soles of the feet where it protrudes as a round flat painful growth through the thickened skin. In Guam after examinations of 2429 normal natives it was found that 74 per cent had contracted the disease, generally during childhood. (Figs. 46, 47, and 48.)

It has an incubation stage of two to twenty weeks; the eruption is preceded by an initial fever of variable intensity of about one week and during its decline the eruption appears, preceded by a patchy white desquamation, in which minute papules push up through the skin and acquire a cheesy, yellow summit; the typical yaw may grow in two weeks to any size up to 3 cm. (1¼ inches) in diameter, as a rounded excresence, capped and enclosed by the yellow material, which dries and becomes a firmly adherent, dark or black crust; it requires some force to remove the crust, when a smooth, rounded, red, painless swelling is seen extending ⅛ to ⅜ inch above the surface of the skin, somewhat resembling a raspberry from which it has its name; the crust soon re-forms; it remains stationary several weeks and then shrinks and falls off. Several yaws, especially about the mouth and anus, may coalesce, leaving an ulcerated and fissured base; according to the nature of the mixed infection, ulcerations of various degrees occur and may persist for years; healing of these surfaces often leaves marked cicatricial deformity; recurrences are not uncommon. In

Fig. 46.—Yaws in Samoa. (U. S. Navy Med. Bulletin.)

over 90 per cent the Treponema pertenue was demonstrated and all cases gave positive serum and Noguchi reactions except in the late or tertiary cases. No syphilis has even been recorded as contracted either in Guam or Samoa.

The treatment by salvarsan, injected into the mus-

Fig. 47.—Yaws in granddaughter. Taytay, Rizal Province, Luzon, P. I., May, 1909. (Philippine Journal of Science.)

cles of the buttocks, was followed by a cure in eight to ten days in all cases that could be controlled; the only delay in healing was due to mixed pyogenic infections; relapses occurred which also healed promptly after larger doses of salvarsan.

Dr. Kurien, of Ceylon, (Report to Colonial Office, August 27, 1916) has treated over 3,000 cases of yaws by salvarsan, arsenobenzol and kharsivan and found them almost equally effective in curing the disease in from three days to three weeks.

The diseases of protozoal origin referred to by Castellani, are yaws, kala-azar, oriental sore, and relapsing

Fig. 48.—Yaws in grandfather. Taytay, Rizal Province, Luzon, P. I., 1909. (Philippine Journal of Science.)

fever. In yaws, on Castellani's experience tartar emetic gives better results when combined with other drugs, especially potassium iodide. Although salvarsan and neosalvarsan are without doubt the specific drugs for yaws, it is often difficult to arrange for the administration of intravenous injections in out of the way districts and

*The Treatment of Certain Diseases of Protozoal Origin by Tartar Emetic, Alone and in Combination, *British Medical Journal*, Oct. 21, 1916, pp. 552-553.

also many patients refuse to submit to any form of injection. For these and other reasons an internal treatment by easily obtainable drugs is much to be desired and Castellani gives a prescription which has given excellent results in Ceylon.

He devised his "yaws mixture" containing tartar emetic, salicylate of soda, potassium iodide and sodium bicarbonate. The sodium salicylate "seems to hasten the disappearance of the thick yellow crusts." The sodium bicarbonate decreases the emetic properties of the mixture. At the same time it makes it cloudy but, through the intervention of the editor of the *British Medical Journal,* successful attempts have been made to obviate this. The result is the modified formula given below:

Tartar emetic	gr. j
Sod. bicarb.	gr. xv
Sod. salicylate	gr. x
Potass. iodide	dr. j
Glycerine	dr. ij
Or syrup	dr. j
Or sod. tartarate	gr. x
Aquæ	ad. oz. j

Castellani thinks that glycerine gives the clearest mixture. It is given diluted in water three times a day; half doses to Europeans. The mixture was given for ten to fifteen days, then five to ten days' rest; then another course for another five or ten or fifteen days, and satisfactory results were obtained in fairly recent cases in which the disease had started three to twelve months previously.

Castellani has recently treated four cases of infantile kala-azar in Corfu. Three cases recovered. They were treated by tartar emetic in intravenous injections (1 per cent tartar emetic in sterilized normal saline), in

intramuscular injections, by the mouth, and by combinations of these methods. The intramuscular method is very convenient in children. To avoid the pain carbolic acid is added according to the following formula:

Tartar emetic	gr. viij
Ac. carbol.	♏ x
Glycerine	dr. iij
Aq. dest.	ad. oz. j

Half to 1 c.c. every other day in the gluteal regions by intramuscular injection. The addition of gr. 1/3 sod. bicarb. makes the mixture slightly alkaline. Martindale's antimonium oxide preparation is considered less good.

The formula for oral administration is as follows:

Tartar emetic	gr. v
Sod. bicarb.	gr. xxx
Glycerine	oz. j
Aq. chlorof.	oz. j
Aquæ	ad. oz. iij

(dr. j to dr. jj in water t. d.)

In adults the dose can be doubled.

A case of oriental sore was rapidly cured by twelve intramuscular injections and the tartar emetic mixture.

Tartar emetic has been used in 17 cases of relapsing fever in Macedonia and Corfu, but in this disease it is less effective than salvarsan; in a large percentage of cases it appears to prevent relapses. Intravenous injections give the best result.

The conclusion is that tartar emetic can be considered a specific in espundia, granuloma inguinale, and leishmaniosis, that it is efficacious in yaws and seems to have a beneficial action also in relapsing fever.

Chronic Ulcerations

The etiology of these conditions, so common among the natives of the equatorial belt, is gradually becoming better understood as laboratory methods are introduced.

The chronic ulcers in Guam and Samoa brought to light the fact that the majority of the cases like gangosa and frambesia show positive reactions to the Wassermann and Noguchi tests, respond to salvarsan and other antiluetic treatment and probably have the Treponema pallidum or pertenue as the etiologic factor. Figs. 49, 50, and 51.) Eggers[3] (1914), in a preliminary report, on the spirochetal infection of leg ulcers in China found 115 smears containing spirochetes out of 1,500 collected

Fig. 49.—Gristly healing of tropical phagedenic ulceration. Wassermann positive. Filipino. (Butler: U. S. Navy Bulletin.)

from all over China, and concluded that at least one of the six types of bacilli found is of clinical significance; the others are doubtful and no constant relationship can be shown between the types of bacilli and the spirochetes. The central part of China seemed least involved, but 3,000 specimens are being collected for a future re-

[3]Eggers, H. E.: On the Spirochetal Infection of Ulcers in China, China Med. Jour., Nov., 1914.

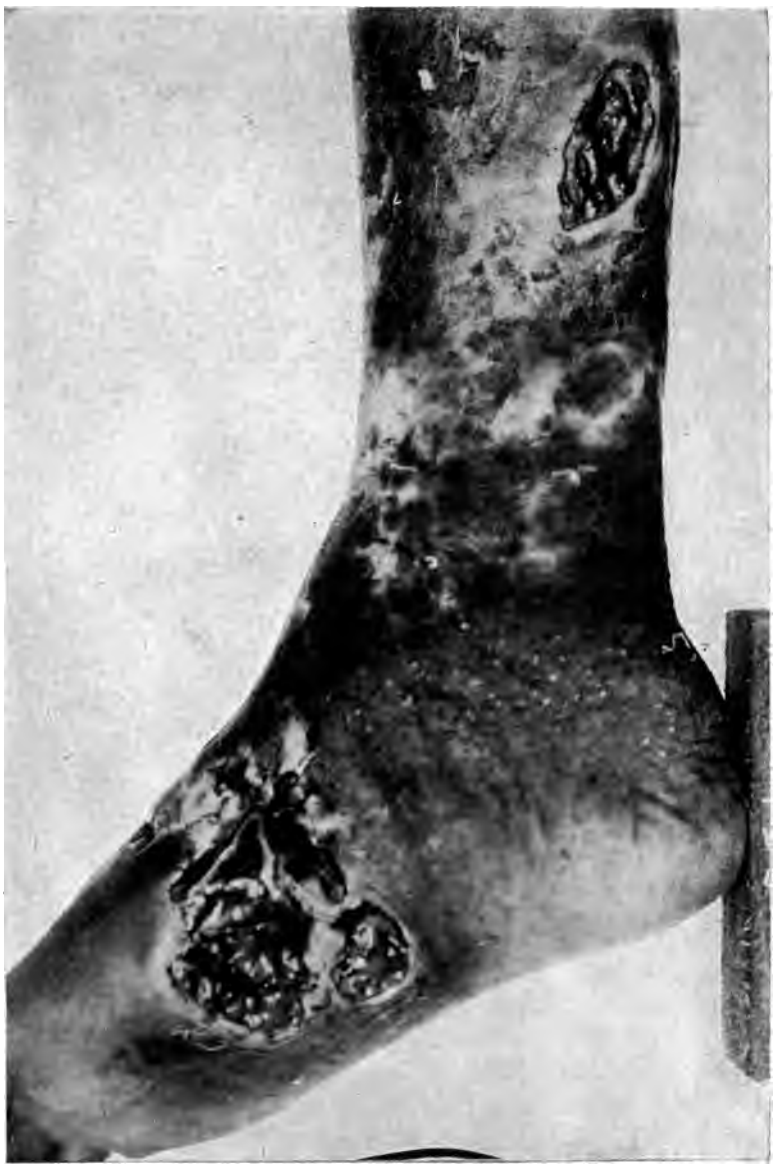
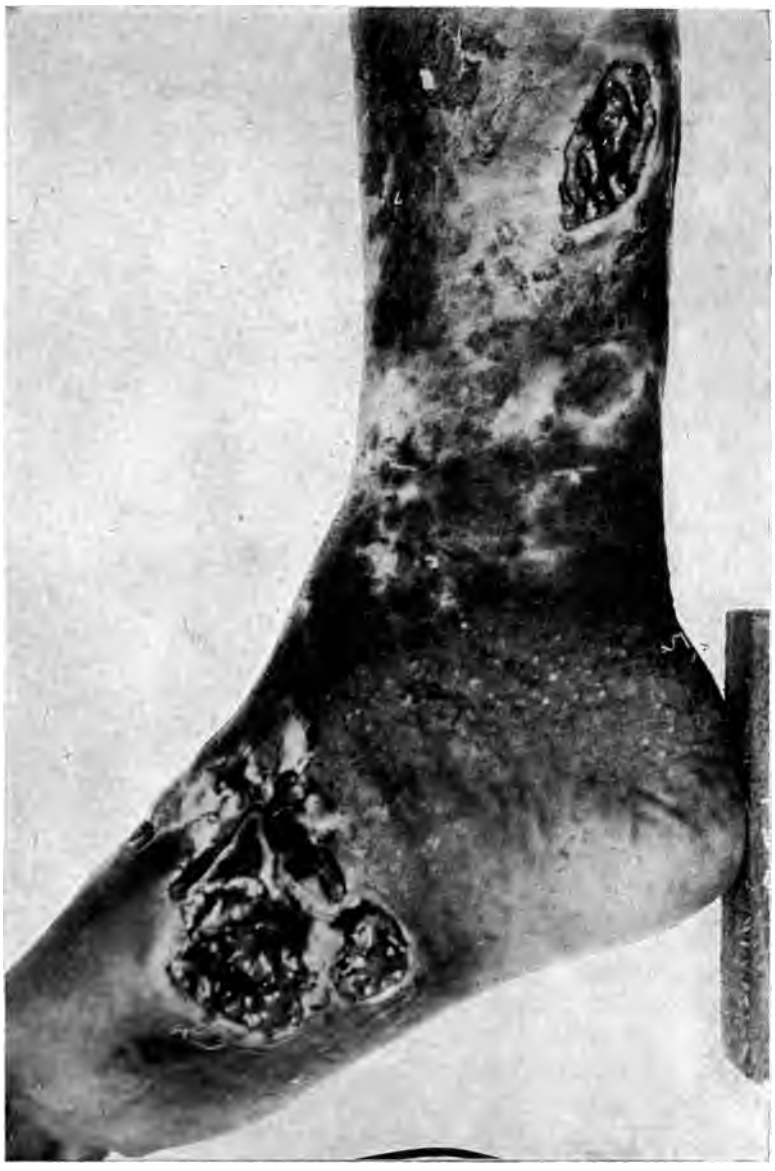


Fig. 50.—Syphilitic ulcerations in Filipino. (Butler: U. S. Navy Med. Bulletin.)

Fig. 51.—"Tropical ulceration." Bone exposed. Positive Wassermann. Filipina. Probably gangosa. (Butler: U. S. Navy Med. Bulletin.)

port. Reed, of Changsha, China, observed little tertiary syphilis, but saw the primary and secondary forms often and suspects that the Treponema there must be of a different strain from the usual.



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LEPROSY

In the absence of successful medical or specific treatment, the operative surgery of leprosy and its complications has not received the attention in standard works that it should and, except in a few leper colonies, the

Fig. 52.—Early nodular leprosy. Infiltration of ear. (Unpublished photo from Hawaii—Courtesy of Moses Clegg.)

radical methods of the surgeon which are the main agents in the treatment are not employed to the extent demanded by this class of sufferers.

Leprosy was described in the Bible by Moses in 1500 B. C., and his instructions for segregation were of divine origin, but Egyptian records of leprosy antedate the

Bible thousands of years. In spite of all that has been done, the disease in some localities is spreading rapidly. Morrow[4] states that "In Basutoland, in 1895, the total number of lepers was 148, and at the close of 1912 there were 700." This increase is probably not entirely due

Fig. 53.—Advanced nodular leprosy. (Unpublished photo from Hawaii—Courtesy of Moses Clegg.)

to new cases as our experience in the Philippines showed that the more efficient the inspection the more cases of leprosy were found. The last reports showed that there were about three million lepers in the world and of

[4]Morrow: South African Med. Rec., June 28, 1913.

these only 169 were of official record in the United States up to 1914; but there are twenty-five hundred lepers in the United States and no leprosarium.

This chronic condition is due to an infection with the bacillus lepræ discovered by Hansen in 1871 and first

Fig. 54.—Pure nerve leprosy. Atrophy and contraction of hands. (Unpublished photo from Hawaii—Courtesy of Moses Clegg.)

successfully cultivated by Moses Clegg in Manila in 1909. The bacilli are found only in the nodular and mixed types; never in the anesthetic form. Although it can not be proved by present methods, the contagiousness of leprosy is admitted by all observers. The field

for investigation of leprosy is still wide open. In general, animal inoculations with leprous material have been negative. The great majority of leprologists hold that leprosy has not been produced in laboratory ani-

Fig. 55.—Nerve leprosy. Infiltration of hand. Facial paralysis. (Unpublished photo from Hawaii—Courtesy of Moses Clegg.)

mals; over seventy unsuccessful attempts have been made to inoculate leprous material in man. The Barbadian leper might be an exceptional subject for study because their pigs, fed on old dressings, developed a peculiar disease with skin lesions and at the same time the rodents

developed the rat leprosy. (Figs. 52, 53, 54, 55, 56, and 57.)

Forty per cent of the children of lepers die during their first year of life but only a small percentage of the survivors develop the disease and then only after an exposure of three to fifteen years; the average exposure necessary is five years. Although an immense amount of work has been and is being done, serodiagnosis and

Fig. 56.—Nerve leprosy. Plantar pedis ulcer. Small toe removed for necrosis. (Unpublished photo from Hawaii—Courtesy of Moses Clegg.)

immunity tests are discouraging and so far are inconclusive. Lepers are subject to all other ills of the flesh, but their sedentary life protects them from the usual amount of traumas and from the penalties of strenuous and high living. The Wassermann reaction is positive in a considerable number of cases and the syphilis which is at times confused with the leprotic state does not seem in any way to be modified by the leprosy and is readily

cleared up by antiluetic treatment. Tuberculosis is another common complication of leprosy and in some colonies 50 per cent of the inmates are tuberculous. The

Fig. 57.—Macular leprosy. Ringworm form of infection. (Unpublished photo from Hawaii—Courtesy of Moses Clegg.)

incidence of cancer and all other affections, except eye lesions and ulcers, seems to be rather low.

The best general treatment is segregation on a fertile island situated in a warm and equable climate, in communities arranged with special regard to municipal and personal hygiene and to social welfare conditions. The nodular and anesthetic lepers should be separated to prevent the development of the mixed type which is rapidly fatal; the usual antituberculosis measures are also indicated. Of alleviating drugs the ancient Chinese remedy, chaulmoogra oil, is the only one that has retained any reputation. The most extensive modern application of this remedy has been made by Heiser[5] whose experiments are very encouraging especially in arresting the disease.

Heiser's formula is, chaulmoogra oil, 60 c.c.; camphorated oil, 60 c.c., and resorcin, 4 gm., sterilized, filtered, and injected under the skin of the arms or legs. Injections were begun with one cubic centimeter weekly and after three weeks the weekly dose was gradually raised to 3 c.c., or more as tolerated. The reaction begins a few hours after injection and lasts till the next day; it follows the first injection only and consists of slight headache, malaise and some nausea. Weekly injections have been kept up for nine months. Within four weeks all patients show marked improvement. The tuberculous forms seem to respond to the treatment better than the anesthetic forms.

The oil is used hypodermically and the prolonged hot baths as employed at the Louisiana Leper Home are made a part of the treatment.

The Surgery of Leprosy

Preoperative Care and Anesthesia.—Owing to the reduced resistance and low nutrition of the skin and other tissues, strong antiseptics are particularly contraindicated. The skin around an ulcer is usually very unhealthy and harbors pathogenic organisms in abundance. Dr.

[5]Heiser, Victor G.: Am. Jour. Trop. Dis., Nov., 1914.

Sandes,[6] of Cape Town, South Africa, who has done splendid work in the surgery of lepers, prepares for operation in the following manner which would be hard to improve upon.

"The previous day the patient was bathed; the particular site well, but gently, washed with soap and water, shaved and swabbed with alcohol. A one per cent alcoholic solution of iodine was then applied, and the part wrapped up in an aseptic cloth. On being placed on the table, the area was swathed with alcohol and a second application of the iodine solution. A large cup of bovril or beef tea one hour before operation seemed to have an excellent and stimulating effect in tiding the patient over the subsequent period of stress and exposure."

Anesthetics.—As a rule even no local anesthetic is necessary in the insensitive areas so common in lepers, especially if the confidence of the patient is secured and surgical violence is avoided; when pain is caused during an operation, novocaine is indicated. Special caution is required during general anesthesia on account of the feeble heart and the general tissue saturation with waste products, germs, and toxins. The drop method with ether is best but for all abdominal and work lower down Sandes relies upon spinal anesthesia which he has found safer and preferable to ether.

The following brief report by W. J. Goodhue of 325 operations, performed in 1913 at the Hawaii Settlement of 700 lepers at Molokai, is ample proof that surgery is the main factor at present in the therapy of leprosy.

Leg amputations	5
Arm amputations	3
Resection of bone for osteomyelitic bone necrosis	120
Radical surgical interference for cure of plantar-pedis ulcer	64
Excision of axillary glands for axillary adenitis	12
Excision of cervical glands for cervical adenitis	4

[6]Sandes, T. Lindsay: South African Med. Rec., June 28, 1913.

Excision of inguinal glands for inguinal adenitis	8
Excision of femoral glands for femoral adenitis	2
Excision of mammary glands for mammary adenitis	2
Excision of submaxillary glands for submaxillary adenitis	3
Lepromatous infiltration ulnar nerve	8
Nerve stretching of ulnar for acute ulna-algia	3
Nerve stretching of ulnar for digital flexion	5
Plastic operation for labial stenosis	2
Plastic operation for inferior labial paralysis	1
Tracheotomy cases for laryngeal stenosis and imminent strangulation	12
Tracheotomy cases for relief of complete aphonia	3
Tonsillotomy	7
Uvulotomy	3
Operation for cure of pterygium of one or both eyes with Paquelin cautery	58
Total number of glandular cases	28
Total	325

Based on observations at this clinic, the great value of tracheotomy should be emphasized. Sandes does not put it any too strongly when he says: "Tracheotomy under local anaesthesia through the upper four rings of the trachea gives instant relief. It is not a brief postponement, but a satisfactory and permanent reprieve as far as the larynx is concerned. The lowering shadows of *mors subita* are dissipated. In a day's time the smiling features of a refreshed and grateful patient tell their own tale." It is done by Goodhue with or without an anesthetic. Often after a few weeks the tube may be removed, the laryngeal condition having subsided.

Ulcers are the most common affliction of lepers; the majority of them are due to even the slightest of injuries, especially burns, and are not leprous in their pathology. They are treated as any other ulcer in a nonleprous patient and the results are as gratifying; skin-grafting is very successful after the surface has been suitably prepared; a warning for the treatment of atrophic ulcer is that if the local circulation is embarrassed by even slight constriction or pressure it will never improve.

Osteomyelitis and necrosis particularly of the hands and feet furnish by far the largest number of operations in lepers and recurrences are frequent. In some cases all that was left of the fingers was a row of finger nails resting on the metacarpal bones, the characteristic adactylate stump of leprosy. This bone destruction is due as much to trophic disturbances shown by decalcification and osteoporosis as to microbic causes which are often secondary invaders. The treatment should be radical removal of an affected bone or its shaft to prevent recurrences and sinus formation.

Neurologic Operations for the results of deposits in nerve trunks causing contractures differ not at all from these procedures elsewhere. Interference with the continuity of the nerve itself is followed by bad results. Nerve anastomosis to arrest changes has not been tried in suitable early cases, but on terminal cases Sandes claims it will restore a considerable amount of sensation, appreciation of pain, and tactile sense.

The Eye Complications are a most serious feature of leprosy; in the first decade 90 per cent are affected and the treatment has been so unsatisfactory that an ophthalmologist should be stationed at every leper colony. Opacities from corneal ulceration following ectropion, due to paresis of the orbicularis, are very common. Chronic iridocyclitis is said to be the most serious lesion; with occluded pupil and secondary cataract it results in total blindness in many, and all become more or less blind. The retina and the optic nerve usually escape damage until very late and then it is not usually due to the lepra bacillus.

SURGICAL TUBERCULOSIS

In the Philippines, tuberculosis affects probably the entire population and about 2 per cent of the population have the disease in an advanced form; from reports it is

probable that this rate also obtains in the crowded sections of India and China. It is very rare in cattle; is practically unknown among the carabaos or water buffalo, pigs and goats; but surgical tuberculosis among the natives is not uncommon. In 10,000 surgical cases in Manila I found about 500 cases of bone, joint, and glandular tuberculosis, mostly glandular. There is nothing to distinguish these cases clinically from those of temperate zones.

DISEASES OF THE SKIN

Dermal Leishmanioses (Oriental Sore, Aleppo Boil, Biskra Button, Delhi Sore, Fly Bite, Etc.)

This condition has as many names as districts in which it occurs. It is widely scattered throughout both tropic and subtropic countries and elsewhere wherever laboratories for medical research are established. Darling[7] discovered two autochthonous cases of Oriental sore in the Canal Zone in 1910 and gives a complete history of the disease to date in his report. The pathogenic agent of Oriental sore, Oriental boil, Aleppo boil, Biskra button, Delhi sore, "Fly bite," "Bess el temeur," etc., is morphologically indistinguishable from the Leishman-Donovan bodies found in fatal kala-azar and named by Ross, "Leishmania donovani;" yet there are certain biologic differences between the parasites of kala-azar and Oriental sore, in that infections by the so-called Leishmania tropicum are limited to the skin, particularly those parts exposed to sunlight; even in its insect host, the mosquito or the fly, it has the necessary light by translucence, whereas the Leishmania donovani of kala-azar requires darkness. It usually attacks children before the seventh year and one attack generally confers immunity.

[7]Darling, S. T.: Dermal Leishmaniasis in a Native Colombian, Proc. Canal Zone Med. Assn., 1911, iv, part 1, 154, 177.

The sores first appear as papules on exposed parts of the body, but other parts are susceptible to autoinoculation. There is a nodular form which may be single or multiple and which may develop no further; a common type is the solitary ulcer. The incubation period is from three to twenty weeks and the sore very often has its origin in a definite fly bite. The maximum size of single ulcers is 6 to 8 cm. (2 to 3 inches) which is attained by progressive ulceration in from six to eighteen months when it gradually diminishes and the ulcer heals. The constitutional symptoms are not marked; pain is unusual and it is not a very serious condition. A positive diagnosis is made by finding the parasites in smears or sections of tissue; the bodies are also easily cultivated from very young lesions on blood agar and typical "buttons" can be inoculated on either man, monkeys, or dogs. On monkeys and dogs the nose grows the "button" most successfully. The treatment will continue to be expectant until the exact mode of infection is discovered; early excision gives good results. The repulsive ulcerating granulomas of the pudenda, tropical sloughing phagedena, gangrenous proctitis, etc., are clinically all severe mixed pyogenic infections usually in marantic subjects. The etiology of the leg ulcers so commonly met with and which frequently become cancerous will, when more carefully studied by laboratory methods, undoubtedly be cleared up. (See page 128 under Yaws for Castellani's treatment.)

Tropical Dermatomycosis

This is a large subject and our only exact knowledge of it is due mostly to the researches of Castellani.[8] A recapitulation of his investigations must be limited to: Tinea cruris, Tinea capitis tropicalis, Tinea Flava et nigra, Intertrigo saccharomycetica and Tinea imbricata.

[8]Castellani, Aldo: Tr. Soc. Trop. Med. and Hyg., 1913, vi, No. 3.

"Tinea cruris has been known to tropical practitioners under the name of 'dhobie itch.' For the fungus most commonly found in such cases, characterized by the peculiar yellowish color of its colonies, he suggested the term 'Trichophyton cruris.' In 1907 Sabouraud investigated very completely the same condition in France which he called 'Tinea inguinalis.' There can be no doubt that this is the dhobie itch of tropical authors, or Tinea cruris. Tinea cruris may be caused by several species of fungus, each of which gives rise to a slightly different variety of the disease.

"Up to the present Castellani has observed the following organisms: Ep. cruris, Ep. perneti, Ep. rubrum, Trichophyton nodoformans. Epidermophyton cruris, Castellani (1905); Synonyms: Ep. inguinalis, Sabouraud (1907); Tr. castellani, Brooke (1908) causes the commonest and best known type of the disease as described by all tropical authors, and in Europe by Sabouraud. The condition is characterized by large festooned patches with elevated margins on the scrotoperineal region and inner surface of the thighs; it is an error to consider Tinea cruris as always localized to the groin and armpits. In many cases it spreads to other parts of the body (excepting only the scalp); it may start on the chest and arms and spread to the groin and armpits, or it may even not affect these regions at all. Epidermophyton rubrum, Castellani (1909), or Ep. purpureum, Bang (1911) is characterized by the beautiful deep red pigmentation in Sabouraud and glucose agar. It induces a type of dhobie itch which has a great tendency to spread from the groins and axillæ to other parts of the body. The eruption has often an eczematoid appearance. Trichophyton nodoformans, Castellani (1911) is characterized by the peculiar brick-red color of the cultures on Sabouraud's agar; this color is lost in subcultures. It induces a peculiar

type of dhobie itch with deep nodules along the edge of the eruption.

"*Tinea capitis:* This form is comparatively rare. All the cases were due to the same endoectothrix trichophyton; the scalp presented in all cases numerous white patches covered by an enormous number of pityriasis whitish squamæ. The patches remain bald permanently. The fungus is a Trichophyton endoectothrix, practically identical with T. violaceum of Sabouraud.

"*Intertrige saccharmomycetica:* The affection is apparently rare. It generally attacks the scrotocrural and axillary regions. The affected skin is red and there may be slight exudation. The borders of the eruption are fairly well marked, but never elevated. In most cases there is little itching and the condition may recover spontaneously.

"*Tinea flava:* This dermatomycosis is confused by several authors with the pityriasis versicolor of temperate zones, but the researches of Jeanselme and Castellani tend to prove that it is a separate entity. The disease, which is extremely common in many countries, is characterized by the presence of bright yellow patches found on various parts of the body. It is very difficult to cure. The fungus is a Malassezia, M. tropica, Castellani (1905), which so far has not been grown.

"*Tinea nigra:* This was first described in 1872 by Manson in China, but his observations were forgotten, as they were not quoted by him in his subsequent publications. It was redescribed in 1905 by Castellani in Ceylon. It is characterized by the presence of black patches due to a fungus Foxia mansonia, Castellani (1905).

"*Tinea imbricata:* The etiology of this disease has been the subject of numerous controversies. In recent years the general opinion has been that aspergillus-like fungi are its real causes. From his investigations Castel-

lani considers that aspergilli and aspergillus-like fungi have nothing to do with the condition and that when they are present they are merely saprophytes or contaminations; that they are not trichophytons; they resemble more the achorions. He produced the disease typically in man by inoculating pure cultures of two species of fungi which he isolated, the Endodermophyton concentricum and End. indicum.

"*Trichomycosis flava, rubra et nigra of the axillary regions:* The affected hairs present nodular formations, plainly visible to the naked eye, of rather soft consistency, and easily removable by scraping. The formations are either yellow or black, or less frequently red; they may be very abundant and form a yellow or black or red sheath round the hair. By the use of the microscope these nodules are seen to consist, in the yellow variety, of enormous numbers of bacillary-like bodies, embedded in an amorphous cementing substance; in the red and black varieties large groups of cocci are observed as well. The yellow variety is due to a Nocardia (N. tenuis), the mycelial segments of which, being very thin, have a bacillary appearance. The black variety is due to a symbiosis between the same Nocardia, and a black pigment-producing coccus, which Castellani described under the name of Micrococcus nigrescens. The red variety is caused by a symbiosis between the same Nocardia and a red pigment-producing coccus. Diagnosis: The condition must be differentiated from the various forms of Trichosporosis (piedra, etc.), and from Leptothrix of temperate climates. It is easily distinguished from the former by the fact that Nocardia tenuis in contrast to the various species of Trichosporon is an extremely thin fungus; it differs from the latter by the nodules being soft, easily removed, and by the hairs not becoming brittle; moreover, it is easily curable. Treatment: A good method of treatment is dabbing the hair two or three times daily

with a solution of formalin in spirit (℥i to ℥vi) and applying a sulphur ointment (2 to 5 per cent) at night."

In 1906, in a case of amebic dysentery and suspected hepatic abscess, I found motile amebas in a general pustular cutaneous eruption; in this same case Musgrave and Clegg found amebas in the circulating blood. Keng[9] (1914) describes a dermatitis of small, hard, red, discrete papules, like beginning smallpox, which became vesicles, ruptured and scabbed over; in other cases it was a diffuse spreading erythema with pus in the subcutaneous tissues; each form seemed to spread from the region of the anus of amebic dysentery cases and Entameba histolytica was found in each lesion.

Fig. 58.—Madura foot. (From a specimen in the Army Medical Museum, Washington.)

MYCETOMA, OR "MADURA FOOT"

Mycetoma, or Madura foot, is a fungus condition of the foot, rarely of the hand or other parts of the body, and

[9]Keng: Jour. Trop. Med., 1914, xvii, p. 193.

never of the internal organs. It is found in all warm countries; is common in India; runs a very chronic course and, unless amputated, terminates in death after many years of exhaustion (Fig. 58). The foot becomes enlarged to two or three times the normal; all of its tissues fuse by an oily degeneration into a cystic mass full of sinuses containing the mycotic collections which ooze from openings on the surface. It begins usually on the sole by slow formation as small painless swellings, perhaps half an inch in diameter, which rupture in about a month discharging a viscid, syrupy, synovial, and at times bloody fluid containing minute rounded particles of various colors, white or yellow, black or pink, from which the three clinical varieties derived their names; in these granules are found the pathogenic fungi; pyogenic invasion is usually a complication. Besides the streptothrix mycetomi Laveran and the streptothrix maduræ, Brumpt described six different fungi which can cause clinical mycetoma; four of them, provisionally, are among the mucedineæ.

AINHUM AND CHIGGERS

The surgical curiosity called ainhum, a disease of flat-footed, barefooted peoples, commonest in Africa, which results in a cicatricial band amputation of toes, usually the little toe, according to Creighton Wellman[10] (1914), is probably caused by chiggers. In West Africa he noticed, "that the chigger has, even in healthy feet, a predilection for the under surface of the little toe, and especially so if, as is often the case with barefooted peoples, the skin is cut or torn. It is well known to those who have studied the insect that it invades abraded or irritated surfaces oftener than sound skin. The fold under the proximal joint of the little toe corresponding to the

[10]Wellman, Creighton: Forchheimer-Billings. Therapeusis of Internal Diseases, D. Appleton & Co., iv, 690.

web between the toes is the point where wounds are oftenest made by the sharp grasses, through which the native walks and runs. A principal reason for this is that the little toe of barefooted blacks, especially, lies separate from the others at an angle due to anatomic reasons connected with flat-footedness. When wounds are made here the chiggers persistently invade them and

Fig. 59.—Ainhum. (From Manson.)

must be removed constantly. So these insects seem to play a part, in many instances at least, in the continued irritation which, especially in blacks who have fibrogenetic tendency, leads to the contracting fibroses resulting in ainhum." (Fig. 59.)

THE CHIGGER, SARCOPSYLLA PENETRANS, EWUNDU, OR SAND FLEA

The chigger plays a heavier role in the production of mutilation and disease than hitherto suspected. It is a common pest originally from South America which has

traversed Africa, reached India, and seems to be on its way around the world. Wellman says, "it usually produces no serious lesions, yet I have seen shocking deformities, loss of limbs, gangrene, septicemia, and death result, directly or indirectly, from its presence. Apropos

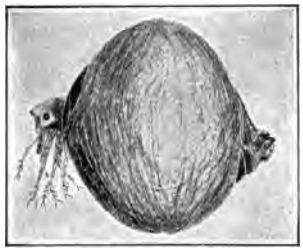

Fig. 60.—Female pregnant chigger *(Sarcopsylla penetrans)*. Magnified. (After Wellman.)

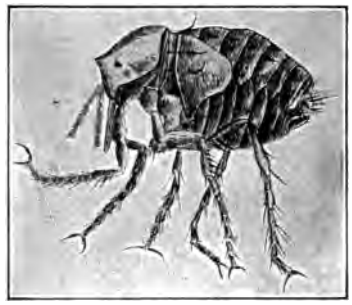

Fig. 61.—Male chigger *(Sarcopsylla penetrans)*. Magnified. (After Wellman.)

of its being the possible transmitter of specific microorganisms, I may mention that I have found various bacteria, including Bacillus lepræ in chiggers but the insect has not been carefully studied to determine if it be a true carrier of such germs." (Figs. 60 and 61.)

GOUNDOU, OR ANAKHRE

This curious disease was first described in 1882 as "the horned men of Africa." It consists of symmetric bony growths of the nasal bones and of the nasal processes of the superior maxillary bones. It usually begins in childhood, and also affects monkeys. The growths ordinarily attain half a hen's egg in size and impart a simian expression to the face. (Fig. 62.) The overlying skin is not involved; the nostrils are bulged inward and are partially obstructed, but no lesions of the mucosa have been observed in the mature cases. Its beginnings are characterized by severe headaches and a sanguinopuru-

lent discharge from the nose for six or eight months when, according to Manson, the pain and discharge subside but the swellings increase painlessly and gradually and in extreme cases may, by their immense size, destroy the eyes by pressure. No careful histopathologic studies seem to have been made of the tumors, but the final result seems to be purely a bony growth. Maclaud (1895) is of the opinion that the disease originates from the larvæ

Fig. 62.—Goundou and leontiasis (Honduras). (U. S. Navy Medical Bulletin.)

of some insect in the nostril and there is much to sustain this theory. It has long been known that several species of flies deposit their eggs in the nasal cavities where the larvæ develop rapidly and if the secondary microbic infections are severe enough, death has often resulted. The early symptoms of goundou are plainly due to an active inflammatory process in the anterior nares and when the specific pathogenic agent is discovered, it will probably be found to be a myiasis. The growths are easily removed by chiseling, and there is no tendency to recur.

Botreau-Roussel (*Bull. Soc. Path. Exot.* June, 1917, vol. X, pp. 480-483) saw 117 cases of goundou on the Ivory Coast and removed the paranasal tumors subperiosteally 108 times, 107 times with success; he groups them: 1. Paranasal tumors the only symptom, 48. 2. Paranasal tumors the most striking symptom, but other hyperostoses present, 62. 3. No paranasal tumor present or, if present, secondary to other hyperostoses, 7. The bones most frequently affected were the tibia, 58; upper jaw, 14; lower jaw, 13; forearm and fibula, 4 each; humerus, femur and clavicle, 2 each; malar bone, 1. There was never any history of intranasal infection or discharge but always one of an eruptive disease called "dobe" lasting from three to twelve months. The dobe was yaws and in the serum of the frambesial nodules Spirocheta castellani was demonstrated.

BUBOES

Buboes of the inguinal region in men, accompanied by a mild degree of fever and considerable pain, running an indolent course, with slight tendency to suppuration, and nonvenereal so far as any evidence is concerned, are quite common in hot countries. The disease was often encountered in the Philippines, especially among white men during the military occupation. Many glands were involved and the tendency was to become chronic. Under expectant and local treatment a low grade inflammation, with softening, occurred in the majority of cases in two or three weeks. Although no venereal disease was discoverable, habitual and even excessive venery was admitted by many of the patients. No evidence of rectal or pelvic disease was evident, and sections of the glands showed inflammatory changes only. The suspicion that the condition in Manila was due to surface absorption of gonococci or other organisms during venereal excesses could not be substantiated bacteriologically; the

only organism discoverable by the incomplete methods employed was the streptococcus in the nodes that suppurated. Little benefit was apparent from local therapy and rest in bed; complete removal of the nodes, which often shelled out easily, was found to be the most satisfactory treatment.

Some authors consider the condition due to a weak strain of plague bacilli, apestis minor, or to a malarial cause, etc. Castellani and Chalmers describe a subacute and chronic form of bubo, and Barlow,[11] in Honduras, encountered an epidemic, nonsuppurating form which was limited to one gland; numerous punctures yielded only sterile juices; it had a sharp onset with pain, fever (102° F.) and redness which subsided in a week or two. Salicylates, 40 grains or more daily, Barlow claims are a specific and that if begun on the first or second day the patient may return to work in three days.

TETANUS

This infection deserves special mention only because it is too often a postoperative complication; it was in Manila, at least in the early days; and tropical surgical clinics should always be on their guard against it and prepared to combat it promptly.

PYOGENIC INFECTIONS

Pyogenic complications of Far Eastern surgery have little to distinguish them from those of other lands. In the warm and moist parts of the earth microorganisms of both the animal and the vegetable kingdom naturally flourish perennially and in profusion as do all tropical growths. Much has been written of the necessity of doubling and trebling the antiseptic surgical precautions in the Tropics on this account, but the only permissible

[11]Barlow, N.: Epidemic Climatic Bubo, Am. Jour. Trop. Dis., 1914, i, No. 11, 787.

technic for sterilizing everything that comes in contact with a wound, wherever an operation is to be performed, is the one that can not be improved upon; namely, the one that is standard and that is in use wherever the best surgery is done; climate, amount and ubiquity of germ life have nothing to do with it. If there is any peculiarity about microbic wound infection in the Tropics, it is probably in that the streptococcus is so rarely encountered

Fig. 63.—Dr. W.'s hand. The photograph was taken at a time when retrogressive changes had set in. At the tip of the forefinger some remains of the cauliflower-like granulations may still be seen.

in wounds compared to its prevalence in temperate zones. The results of pyogenic infections among natives are very frequent and often serious, but this is due to their unhygienic lives and ignorance of asepsis or antisepsis.

Two cases of a peculiar form of hand infection, one in a hospital surgeon and one in a nurse, due to an organism resembling the Koch-Weeks bacillus were reported by

McDill and Wherry.[12] The surgeon had been treating cases of acute suppurating conjunctivitis and a small painful papule appeared on the tip of the right index finger; four days later it was incised but no pus was found; two days after this the nurse lanced it and pricked the pulp of the index finger of her left hand during the operation; the wound secretion was scant and clear and the wound became a cauliflower-like mass (Fig. 63); by

Fig. 64.—A photograph of Miss B.'s hand, taken at a time when gangrene of the forefinger had set in.

the end of the second week the pain was intense and the wound was thoroughly curetted; by the end of the third week it was worse and greatly swollen and a little pus was found on the twenty-eighth day; temperature was never over 102° F.; the pain was intense, there was great

[12]McDill and Wherry: A Report on Two Cases of a Peculiar Form of Hand Infection, Jour. Infect. Dis., 1904, i, No. 1, 58-71.

mental depression and complete loss of appetite; treatment had no apparent effect. In another month complete resolution occurred with good function. The nurse sterilized her wound at once with bichloride solution and applied 95 per cent alcohol compresses, but in three days a painful vesicle formed; continuous packs of a very cold saturated solution of acetate of aluminum were employed; no discharge appeared in the incision; incessant stabbing pains persisted; the digital arteries pulsated with a wirelike tension; only twice the temperature reached 102° F.; pronounced mental and physical prostration, vigilance, sleeplessness and vomiting uninfluenced but little, even by morphine, characterized the condition for three weeks. Twice the soft tissues of the wound were curetted to the exposed bone with relief for only thirty-six hours; the whole hand was swollen at the end of twenty days when the infected area was again cleaned out and the tendon sheaths drained toward the palm. Gangrene of the end of the finger became apparent (Fig. 64) and five weeks after the onset the finger was amputated when three inches of necrotic long flexor tendon pulled away easily. Dr. Wherry's bacteriologic examinations and inoculation experiments on rabbits, guinea pigs and monkeys led him to consider the organism as identical with or as a closely related type of the Koch-Weeks bacillus.

THE ARTHRITIDES

Both rapid and chronic invasion of the joints from localized infection foci anywhere, from gonorrhea, and from syphilis, with local and general symptoms, are not infrequent in the Tropics, and they further closely resemble these conditions elsewhere by being called "rheumatism." The generally reduced bodily resistance of the poorer classes is a tangible factor and the injury to which

the disease is usually traced as the proximate cause is almost always a slight trauma or a chilling of the part by exposure. Probably three-fourths of the cases are due to the organisms of lues and gonorrhea, especially in the seaboard centers of population. These cases of venereal origin, when correctly diagnosed, usually yield readily to vigorous specific treatment combined with attention to the general metabolic disease.

PART II

OBSERVATIONS ON CHINA, JAPAN, AND THE PHILIPPINES, AND COLLATED ANSWERS TO A QUESTIONNAIRE OF FIFTY-THREE INQUIRIES SENT TO COUNTRIES IN AND ABOUT THE TROPIC ZONE IN 1911*

CHAPTER X

OBSERVATIONS ON CHINA, JAPAN, AND THE PHILIPPINES

CHINA

China with her four-thousand-year-old ideals and traditions and the tremendous inertia of her four hundred million people, devoid of public sentiment, real patriotism and a national consciousness, presents to the medical man and sanitarian an almost unapproachable problem. The enthusiastic Occidental who longs to help China clean house and who is baffled at times by her indifference to, or utter rejection of, his well-meant and really beneficent plans for her welfare, must not forget how deep and long she has drunk of the drug of self-sufficiency and complacency. For the past twenty years we have heard much of "awakened China" and yet today among those who have worked hard for her regeneration there is cause for profound discouragement if it is not realized that she is

*Author's Note: I am assured by surgeons recently from China that the answers to this questionnaire do not in some respects represent knowledge concerning medical conditions today; that there has been a very decided improvement since the Manchus were banished and that a survey now would reveal statistics of real value and that there has been a very great advance made in surgery since 1910 and especially since 1912.

yet dazed and stupefied from the effects of her age-long narcotic dreams. It has taken all of the successive blows dealt at her "universal sovereignty" fetish, her defeat by Japan in 1894, by the allied powers in 1900, the treatment of her as a negligible quantity in the Russo-Japanese war fought on her soil in 1904, the encroachments of all the European nations, and lastly, the startling demands of Japan to bring home to at least her ruling powers that the reason for her humiliation is, as a former President once admitted, her weakness.

It would seem that now is a fitting time to call to the attention of those who are responsible for China's future that this weakness has its origin largely in the lack of appreciation of the value to the state of healthy able-bodied citizens, and of the fact that it is impossible to kindle the fires of patriotism and to create an adequate force for national development and protection in sick bodies. Convince the Chinese that the efficiency and energy of their country is reduced over seventy per cent by the chronic curable diseases of tuberculosis, malaria, syphilis, and intestinal parasites, including five million cases of eye diseases, and that these conditions can be remedied, and they will at least tolerate the modern medical man and sanitarian as they already do the foreign political adviser, engineer, and railway builder, particularly under the condition that native controlled institutions and a body of Chinese medical men will be developed. The *sine qua non* in China is government cooperation; no headway can be made in the treatment of a whole people totally ignorant of medical matters without the initiative of their rulers in the establishment of medical institutions and the enforcement of the immediately urgent therapy by official power.

So far, efforts to remedy the physical ills of the Chinese people have been made only in connection with the teaching of religion and have scarcely ruffled a small part of

the surface of the problem. For over one hundred years the medical missionaries of all countries have done their best. There are at present ninety-three Protestant missionary societies at work in various parts of China. There are about four thousand Protestant missionaries, including wives and unmarried women who constitute half their number, and of these nearly five hundred are medical men and women. There are close to twelve hundred foreign and six hundred Chinese Catholic priests also in the field. Hundreds of the missionaries and their converts have suffered martyrdom and time and again they have been driven out and all of their property destroyed. Their greatest service has been in the favorable impression they have made on the Chinese and the proofs they have given of the genuine disinterestedness of their motives. With the Oriental, with whom self-interest is paramount and who has heretofore not been able to conceive of others being without it, this has not been easy of achievement and in spite of all the depreciating stories circulated about the missionaries, their work has been of incalculable value and has become the basis of much mutual understanding in place of suspicion and distrust.

The struggles against incredible odds and with meager support of the mission medical men and women to better conditions is a great story of devotion and unselfishness. It is through their work principally that the evangelistic members have been able to reach the Chinese. They have founded about one hundred hospitals and eleven medical schools, skeletal organizations mostly, but to which can be added the vital elements necessary to develop them to great usefulness. So far the schools have turned out less than two hundred poorly trained Chinese physicians, while tens of thousands of first-class men are needed, and the hospitals, through lack of staff and equipment, are not fulfilling the real functions of hospitals to the communities in which they exist. The number of foreign

trained native doctors is small; they have taken lucrative positions and their influence on the general health situation is very slight. The medical members of the various missions have wisely formed a union for the purpose of organized effort in colleges, societies and publications, and are doing splendid work. There are men in this association who only need backing to go to the top of their profession.

It is to be hoped that the ruling powers of China will take up the problems of health and sanitation without delay, and that they will do so with a long look ahead, will commit themselves to a fixed program covering at least two decades, and be guided by those foreign advisers whose disinterestedness, wisdom and ability are unquestioned. With the experience of all nations and the willing cooperation of the best men of friendly powers at her disposal, China has an opportunity, unique in the world's history, to acquire the strongest educational system of any, because her field has not yet been invaded to any appreciable extent by the unfit and the untrained.

Medical science, long centralized in Europe, is shifting westward to America in many respects. Japan, still further west, is already attracting attention to her ability to take and hold a leading place, and in another century or less it is not unreasonable to expect that if China will drink deep from the fount of pure science only, she can become the actual "middle kingdom" of the world of medicine and science. If China's little, nation-disturbing neighbor, Japan, can accomplish such wonders in medicine and military surgery in thirty years that the rest of the world must govern itself accordingly, China's colossal pride should at least impel her to make a sustained effort to demonstrate her ability to not only do likewise but to do so on a far grander scale.

Even though the psychologic period is apparently present and even though the proposition is to us so plainly

beneficent and it is so obvious that great and certain power follows real knowledge, in order to receive consideration, the idea must be presented to the Chinese with due regard to their peculiar state of mind and habits of thought or there is always danger of it being received with impenetrable apathy. It must be remembered that the obvious and essential to the Occidental mind may be an uninteresting triviality to the Oriental, that much of our enthusiasm and zeal is inexplicable to him and that there is a great necessity to proceed slowly and with calmness in presenting any problem. "A Chinaman will not hear patiently in a month what a Frenchman can say in an hour." But there is one opening in his armor of phlegmatic calm through which he may be reached. He is intensely appreciative of success. Once he is shown that a thing really works and accomplishes its object, his sympathy and admiration are enlisted because success to him means, not only so much in dollars and cents, but to his superstitious mind it spells the favor of his gods as well.

Although every disease is prevalent in China, the epidemic diseases devastating at times and leprosy not segregated and although the Chinese generally use cooked food and drink, the answers to my questionnaire of 1911 from all parts of China showed that the predominating diseases were tuberculosis, syphilis, and intestinal parasites. When statistics are available, malaria will probably also be found in this group. Surgery, except for the most obvious and pressing conditions which can be handled by ordinary skill and equipment, is as yet undeveloped in China except in university centers.

Medicine as Practiced by the Chinese*

Since the opening of the Canton Hospital in 1838, the advance of Western medicine in China has been gradual but continuous. Of recent

*By William W. Cadbury, M.D., Physician to the Canton Christian College, Canton, China. Reprinted from Med. Rec., New York, Aug. 26, 1916. Published by permission of Dr. Cadbury.

years the medical profession of the United States has shown considerable interest in the hospitals and medical schools established by missionaries, and this interest has been greatly intensified by the recent announcements of the China Medical Board of the Rockefeller Foundation that it is their intention to assist and carry on the institutions already established at Peking and Shanghai. It is the purpose of the Board to make the schools equal to or even better than any now existing in the United States.

In view of this greater interest of the medical profession of our country, there is doubtless more or less speculation as to what is the status of Chinese medicine as it has existed and still exists among the people of this vast empire. The notes here submitted are partly the result of personal observation in the city of Canton, and partly of conversations with a Chinese doctor of the old style. I have also referred largely to the articles noted below under references.

Medicine in China may be considered under two divisions—the purely superstitious, which depends on charms and magic and is largely fostered by the Taoist priests, and the art of medicine as practiced by the Chinese doctor. These two phases of treatment of the sick are closely interwoven with one another so that it is sometimes impossible to draw the line between them.

Let us first consider the superstitious practices and beliefs. In the city of Canton may be found temples dedicated to the "Spirit of Medicine," or healing. The ignorant people, especially women, believe that the deity presiding in these temples can restore health upon the payment of small sums of money to the priest and the performance of certain rites.

Chinese medicine, like philosophy, rests on a dualistic basis. At the bottom of all the laws of the universe are two principles, the "yang" and the "yin." They are generally represented by a circle divided into two parts, each of which is a comma-shaped object resembling a serpent. One is white and the other black, or one is green and the other red. The circle represents the great absolute and the two divisions within it the "yang" and the "yin." Again the "yang" or male element or force is represented by straight lines, and the "yin" or female element by broken lines. Thus the pantagram was devised by a Chinese emperor about the year 2900 B. C. This is made up of combinations of straight and broken lines surrounding the circle and its two divisions, making a perfect emblem of the balancing of the forces of the universe. Over many a doorway in China this sign is displayed to warn off evil spirits. The principle of duality typified by the "yang" and "yin" is more comprehensive than "male" and "female." They stand for positive and negative, the sun and the moon, light and dark, acid and base, heaven and earth, and they correspond to Ohrmuzd and Ahriman of the Zoroastrians, Osiris and Isis of the Egyptians, the even and the odd of Pythagoras.

The universe with its dual forces is a macrocosm. Man is the micro-

cosm. Thus we read that as heaven has its orders of stars, and earth its currents of water, so man has his pulse. As earth has its water courses, called lakes, springs, etc., so man has his courses in the pulse—the three "yang" and the three "yin."

The priests explain these forces of the universe by personifications in the form of evil spirits or devils, and the people are kept in constant fear of these demons of the air which they believe are constantly bent on bringing disease or death. Hence the many superstitious practices resorted to for deceiving or warding off the evil spirits. The priests recite incantations, paper money is burned, and the pantagram is hung over the doorway. The demons are especially fond of marring beautiful children, hence the parents invent disgusting names for their offspring in the hope of misleading these tormentors. Boys are especially liable to injury at the devils' hands. Hence a guest never inquires into the sex of a newborn child, and a boy is often dressed as a girl and called by a female name.

The Chinese physician is quite a different individual from the Taoist priest, although magic and astrology are inextricably bound in with his theories of the human organism.

The first authority on medicine in China was the Emperor Chen Long, who lived about 2737 B. C., and made a classification of some hundred medicinal plants. A later emperor wrote up medical science so far as it had progressed in 2637 B. C. In the earlier ages there was some progress in anatomy, but for the last one thousand years at least, there has been practically no advance. The profound respect for the dead has interfered with dissecting and the performing of autopsies. Again there is no cooperation between doctors and no medical organization. The so-called Imperial Academy of Medicine at Peking has no jurisdiction over physicians in other parts of the country. It is composed of the physicians to the emperor. They give instruction to the younger members in the medical classics. Generally speaking the practice of medicine is unlicensed. Most doctors receive their library from a father or relative who also imparts the secret remedies on which his reputation was established. During his apprenticeship the young doctor diligently studies the classical books and practices palpation of the pulse. The doctor is called upon only for more serious maladies. For the simpler complaints home remedies and the formulas of old women are used. In times of war the Chinese soldiers attend to their own wounds. Advertisement is quite ethical and the office of a doctor may be recognized by the tablets displayed about the entrance, on which the skill of the physician is testified to in high-sounding phrases. These testimonials are usually signed and presented to the doctor by grateful patients. The name of the doctor is of great importance, thus one hears of Dr. "Root-of-Strength," Dr. "Rhubarb" and Dr. "Salts of Hartshorne."

As one would suspect from the absence of dissection and the experimental methods, the Chinese conception of physiology and anatomy is fanciful to the extreme. The body is said to be divided into three

parts: (1) the upper or head; (2) the middle or chest; and (3) the lower part, or abdomen, and lower extremities. Life depends on the equilibrium of the "yang" and the "yin." It is but one manifestation of the universal life. The body is the microcosm, the universe the macrocosm. The "yang" is the warm principle, actively flowing. The "yin" is the moist principle passively flowing. As the whole order of the universe results from the perfect equilibrium of these two forces, so the health of man depends upon their equilibrium in the body. If the "yang" or active principle predominates, there is excitation; if the "yin" or passive principle predominates, there is depression of the organism. The action of these two forces manifests itself through eleven organs: the heart, liver, lungs, spleen, left kidney, large and small intestines, stomach, gall bladder, urinary bladder, and right kidney. The lungs are divided into four large and two small lobes. The larynx passes directly into the heart, which is the organ of thought, together with the spleen. The liver has seven distinct divisions. The gall bladder is the seat of courage. The urine passes directly from the small intestines into the urinary bladder through the ileocecal valve. The brain and spinal marrow produce the semen which passes directly into the testicles. There are said to be three hundred and sixty-five bones in the body.

Functionally the viscera are divided into two groups known as the six viscera in which the "yang" resides, and the five viscera in which the "yin" resides. The first group is composed of the gall bladder, stomach, small intestine, large intestine, bladder, and left kidney, with its three heat centers the three lumbar sympathetic ganglia. The five viscera are the heart, liver, lungs, spleen, and right kidney. The diaphragm is placed beneath the heart and lungs, and covers over the intestines, spine, and stomach. It is an impervious membrane and covers over the foul gases, not allowing them to rise into the heart and lungs. The stomach, spleen, and small intestines are the digestive organs. They prepare the blood which is received by the heart and set in motion by the lungs. The liver and gall bladder filter out the various humors. The lungs expel the foul gases. The kidneys filter the blood, while coarser material is evacuated by the large intestines. The "yang" which is of subtle nature has a constant tendency to rise. The "yin" which occupies the brain and vertebral column, as well as the five viscera, tends to descend.

Each of the organs has a canal whereby it communicates with other organs. Thus the liver, kidney, and spleen are connected with the heart by special vessels and the vas deferens arises from the kidney. Some of these communicating channels end in the hands and some in the feet. One of the vessels in the little finger is used to determine the nature of infantile diseases. Six of these vessels carry the "yang" and six carry the "yin." These two forces are disseminated through the whole organism by means of the gases and the blood. The former act upon the latter as the wind upon the sea. The interaction of these two

as they circulate in the vessels produces the pulse. The blood makes a complete circulation of the body about fifty times in twenty-four hours. In these fifty revolutions the blood passes twenty-five times through the male channels or those of the active principle and twenty-five times through the female channels or those of the negative principle. The blood is said to return to its starting place once in every half hour, instead of once in twenty-five seconds, according to modern physiologists, having traversed a course of some fifty-four meters.

Each organ is related to an element: fire rules the heart, metal the lungs, etc. There is likewise a close relationship to the planets, to season, color, and taste. This interrelationship is well illustrated by the following table:—

Organ	Planet	Element	Color	Taste
Stomach	Saturn	Earth	Yellow	Sweet
Liver	Jupiter	Wood	Green	Sour
Heart	Mars	Fire	Red	Bitter
Lungs	Venus	Metal	White	Sharp
Kidney	Mercury	Water	Black	Salt

Auscultation and percussion are wholly unknown as diagnostic aids to the Chinese physician. Entire reliance is placed on palpation of the pulse and the general facies of the patient in making the diagnosis. The taking of the pulse is almost like a solemn rite.

The pulse may be palpated at eleven different points, as follows:— Radial, cubital, temporal, posterior, auricular, pedal, posterior tibial, external plantar, precordial, and in three places over the aorta. Usually, however, the physician is satisfied with the palpation of the pulse of the right and left wrist. With the right hand he feels the left pulse and with the left hand the right pulse. He applies three fingers,—the ring, middle and index finger over the pulse and the thumb underneath the wrist. Then he palpates the pulse with each finger successively. Under the ring finger the pulse of the right hand reveals the condition of the lung, middle of chest, and large intestines, while in the left hand the ring finger determines the state of the heart and the small intestines. The pulse under the middle finger corresponds on the right to the condition of the stomach and spleen, on the left to the state of the liver and gall bladder. The index finger placed over the pulse of the right radial shows the condition of the bladder and the lower portion of the body, over the left radial it reveals the state of the kidneys and ureters. For each of these six pulses the physician must practice weak, moderate, and strong pressure, to determine whether the pulse be superficial, moderate, or deep. This must be done during nine complete inspirations. If the pulse be rapid the "yang" principle is predominant, if slow, the "yin" is predominant. There are twenty-four main varieties of pulse. The Chinese physician must be trained to palpate the pulse so skillfully that by this single means the nature of diseases and even the months of gestation in a pregnant woman may be determined. Ten or more minutes must be spent in the palpation of the pulses.

Sometimes a Chinese physician will consider other factors. For ex-

ample, it is said that by examination of the tongue thirty-six symptoms may be diagnosed according as the tongue is white, yellow, blue, red, or black, and depending on the extent of the coating. From the general appearance of the face and nose the state of the lungs may be discovered. Examination of the eyes, orbits, and eyebrows shows the condition of the liver. The cheeks and tongue vary with the state of the heart, the end of the nose with the stomach. The ears suggest the conditions of the kidneys; the mouth and lips the state of the spleen and stomach. The color and figure of the patient also count in a diagnosis.

Diseases are spoken of as internal and external. External cases are those apparent on the surface, such as all skin affectations, tumors growing on the surface and of late all surgery has been classified as the practice of external diseases. Internal diseases include all fevers and diseases of the heart, lungs, and abdominal organs. More specifically diseases are classified under nine heads as follows: (1) Affections of the great blood vessels, including smallpox; (2) diseases of the lesser blood vessels; (3) fevers; (4) female complaints; (5) cutaneous diseases; (6) conditions requiring acupuncture; (7) diseases of the throat, mouth, and teeth; (8) diseases of the bones; (9) affections of the eye.

Diseases are said to be produced by internal and external agents. Among the external diseases are: (1) wind, which causes headache or apoplexy, dizziness, chapping of face, diseases of the eye, ear, nose, tongue, teeth, etc.; (2) cold may cause cough, cholera, heart pains, rheumatism, and abdominal pains; (3) heat causes chills and diarrhea; from dampness comes constipation, distention of abdomen, watery diarrhea, gonorrhea, nausea, pain in kidneys, jaundice, anasarca, pain in small intestines, and pain in the feet; (5) from dryness come thirst and constipation; (6) Fire causes pain in the sides, diabetes, etc. The diseases of internal origin are classified as disorders of the gases, blood, sputum, and depressed spirits.

The treatment of disease by the Chinese doctor consists chiefly in the administration of drugs. Surgery has been an unknown art. Recently two charitable institutions have been established in Canton for the treatment of the sick according to native methods of practice. At one of these so-called hospitals I was informed that bullets were removed by placing a kind of plaster at the wound of entrance. The ingredients of the plaster have a remarkable magnetic power over the embedded bullet and gradually draw it out through the same opening by which it entered. My informant had never seen this line of treatment actually carried out, however.

Perhaps in no line does the native practitioner show his ignorance more than in the treatment of fractures. No attempt is made to reduce the parts. A special clay is placed in a wooden bowl. The heads of several chickens are cut off, while incantations are repeated and the blood is allowed to flow on the clay in the bowl. Blood and clay are now mixed together and applied to the fractured extremity. Bandages are used to bind on thin strips of bamboo. When the last turn of the

bandage is being wound on, the blood of another chicken is poured on.

The only real operation performed by the Chinese is the castration of the eunuch, and castration as a penalty for adultery. With one sweep of a sharp knife the genital organs are completely removed on a level with the skin of the pubis. A metal plug is inserted in the urethral opening and a cloth wrung out of cold water is applied to the bleeding surface and firmly bound on. The patient is allowed to drink no water for three days when the dressing is removed, the plug withdrawn and the patient allowed to urinate.

Coming now to the real field of the Chinese doctor we find that the number and variety of remedies recommended by the Chinese Materia Medica can only be compared to our own National Pharmacopeia. The great Materia Medica compiled in the 16th century is composed of 52 books and contains 1892 remedies. Kipling's verse applies to the Chinese as to the British people for whom he wrote it:

"Alexanders and Marigold,
Eyebright, Orris, and Elecampane,
Basil, Rocket, Valerain, Rue,
(Almost singing themselves they run)
Vervain, Dittany, Call-me-to-you,
Cowslip, Melilot, Rose of the Sun,
Anything green that grew out of the mould,
Was an excellent herb to our fathers of old."

The drugs and other medicaments are weighed out according to a decimal system as follows:

1 tael or leung	equals	40.00	gm.
1 tsin	"	4.00	gm.
1 fan	"	.4	gm.
1 lei	"	.04	gm.
1 ho	"	.004	gm.

Often a prescription is given because of the resemblance of the drug to the organ affected. Thus for renal diseases, haricot or kidney beans are given. Minerals are administered as salts. Plants are used in the form of roots, stems, leaves, flowers, and dried fruits. The bones of a tiger are frequently ground up and given to a debilitated person. The grasshopper is dried and used as a medicine and the shells of the cicada are collected from the bark of trees and mixed with other ingredients. Tinctures and extracts are prepared from rice wine. Pills are often made with a thick shell of paraffine which is broken off and the contents chewed up. Various forms of plasters and blisters may be applied to the skin. The actual cautery is often used as a revulsive.

Among the pills the best are the "Wai Shaang Uen" or life-preserving pills costing about a dollar apiece. They are composed of Manchurian ginseng, deer's horns, and other drugs. Among other common remedies may be named dried, powdered rattlesnake skins, the bile of

the ox and dog for jaundice, dried shrimps, etc. Quicksilver is often poured into gunshot wounds in order to dissolve the bullet. In some drug shops two signs are hung at the entrance; on one are written the names of venereal diseases, on the other such diseases as hemorrhoids, wounds, ulcers, etc. The patient explains in which class his disease belongs and is promptly given the appropriate remedy. Among the most used drugs are some that are found in the western pharmacopeias; viz., ginseng, rhubarb, sulphur, pomegranate root, aconite, opium, arsenic, and mercury.

Diseases of the liver and eyes, which are sympathetic organs, are cured by giving pork's liver. In Kwangtung Province human blood is considered an excellent remedy and at executions people may be seen collecting the blood in little vials. It is then cooked and eaten. A genuine prescription written by a physician to be used as a laxative was composed of rumex hydrolepathium, quercus glauca, sodium sulphate, and magnolia hypoleuca. The parts from these plants are boiled with the sodium sulphate and the "tea" is drunk by the patient.

A remedy which I have not infrequently seen applied to a patient *in extremis* is as follows: A rooster is killed and the body is cut in half, longitudinally, and the bleeding half is quickly applied to the skin of the patient's abdomen. If there is any possibility of cure this is supposed to be infallible.

The use of the acupuncture needle seems to be seldom resorted to in the neighborhood of Canton. The theory on which it is based is that if one punctures the blood vessels connecting different organs the disease will be aborted. Three hundred and eighty-eight points suitable for acupuncture are described. There is a manikin at Peking pierced with holes at all the points suitable for acupuncture. Paper is pasted over it and students learn to find the proper holes through the paper. The needles vary from 1½ to 28 cm. in length and are made of gold, silver, or steel. During the operation the patient coughs and the errant humors are directed back into their normal courses.

Such in brief is medicine as it is practiced by the Chinese doctor of today. One is reminded of the old humoral theory of Europe in the Middle Ages. But modern education in China has brought a new light to the people and in all the large cities and many of the small ones, Western medicine is slowly but surely winning its way.

JAPAN

Medical education in Japan was founded by German teachers about thirty-five years ago. The official language for medicine and allied sciences was German, which is used to a considerable extent today. About twelve years ago the last of the foreign teachers were replaced by Japanese.

The place Japanese medical scientists have taken in the world needs no comment except perhaps to call attention to the brief period in which it has been attained as an evidence of the immense value of a definite prearranged plan, carried out to the letter. This shows in all phases of their national development and in medicine even as early as 1900 when the Japanese medical corps in the army at Pekin was superior to that of any other nation. Their victory over Russia in 1904-1905 was a victory of the extreme scientific efficiency of a small army over enormous odds in men and money in an army in which such methods were wanting; the medical corps of the Japanese army by prearrangement guaranteed against the loss of men by disease and was the main factor in the success of their arms.

The influence of modern medicine, applied entirely by Japanese, on the national health and welfare is one of the chief sources of her strength and is her guarantee against decadence. In these respects she is far ahead of other nations, some with centuries of history behind them, and Japan, after less than forty years development from a chaotic condition, is held up as a model they must follow or suffer the consequences. The weak point in her medical educational system is her second grade medical schools whose preliminary educational requirements are those of the middle public schools which have three years less work than the higher schools from which one can enter the university medical school. Admission to the second grade medical school is by competitive examination which is rather strict, but Chinese are admitted with no condition other than that of being able to speak Japanese.

The Surgery of Japan

Several years ago Professors Scriba (German), Sato, and Kundo, surgeons of the Imperial University of Tokyo,

informed me that the number of leg and foot ulcers was very large but no cases of Madura foot had been seen; that in former years there was a great deal of syphilis in Japan and also considerable venereal disease; that beriberi is common among the young, strong, and healthy; that cancer, except of the skin, is common; that surgical tuberculosis and other chronic surgery occurs in about the same percentage as in Europe and that their general results are good. The only surgical condition they considered peculiar to Japan they called "Kakke" and had made it the subject of special researches. It is an acute suppurating myositis, ushered in by fever, followed in three or four days by deep and superficial furunculosis which later developed into large intramuscular abscesses. Under drainage these abscesses heal and the patients usually recover completely in uncomplicated cases. The result of the investigations into the specific microbic cause and source of infection had not been determined.

THE PHILIPPINES

The natives of the Philippine archipelago belong to the Malay race, and while there are very few pure Malays among the leaders, the stock has been improved by the admixture of other blood especially that of the Chinese. They are the most enlightened and vigorous branch of the Malays, have been Christians for centuries, and are nearest akin to Europeans in thought and aspirations of any alien race. They are eager to learn all that can be imparted, and have evinced such intelligent capacity that their rapid progress in the art of self-government and their universal desire for education should appeal strongly to American sympathy.

As in other Oriental countries, the efficiency of the natives is enormously decreased by chronic curable disease, but their salvation in this respect can not be assured

until a competent body of native medical men is developed. There are two medical schools; one a government and one a church school. Premedical and medical education is now well established in the government school only; the students are earnest, studious, intelligent, and hard working. The Filipino women hold a very high position of influence for good, and their force, dignity, and strength of character are striking. The aptitude of the younger women for nursing and the medical profession will be of enormous value to their race in solving its physical problems. The principal diseases are due to malaria, tuberculosis, and intestinal parasites. The epidemics of cholera, plague, and smallpox have been brought under control for a time at least by the splendid work of the American Department of Health, but so far no impression has been made on the more important tuberculosis, malarial, or intestinal diseases, and none will be until education in health matters is further advanced and a large body of trained native medical men is created. There are less than 500 doctors for the population of eight million, one to each 20,000 of the population or one to each 420 square miles of territory, and of these over 250 are in the city of Manila.

Although next to police and fire protection, the health of the people was the most crying need of the Philippines, it was eight years after the Americans took over the government of the Islands before they recognized the desirability of public medical institutions or medical education in any but an academic way. The only medical organization supported by public funds during this period, outside of board of health work, was one to care for high officials, their families and those dependent upon them; this was later extended to include all employees of the government and their families.

Medical education is making poor progress in the Philippines and will not improve until a new start is made.

The government must formally recognize its health problems and commit itself to a program that will ultimately solve them. Several thousand competent native medical men are needed. The profession of medicine and public health must be made attractive to students by the founding of numerous scholarships and the creation of a department of public health in which there is a future for ambitious men. The present organization of the government university medical school and hospitals is ideal only so far as its plan on paper is concerned. It has broken down through lack of direction which could organize the independent and discordant elements into a harmonious whole. There is no real cooperative clinical, teaching, and hospital organization, no true spirit founded on the correct and practical philosophy and psychology which should saturate from above downwards each worker, unit, institution, and student, without which adequate public support and pride in the institutions can not be expected. Foreign medical men selected with great care as teachers, who from the ordinary standpoint were the best trained and equipped men available, are too often failures because no attention is paid to preparing them to accept things as they find them, to lay aside their prejudices and to cultivate a real sympathy, understanding, and aptitude for the native problems. The church medical school has a far lower standard than ordinary minimum educational requirements demand. This school graduates more men and perpetuates a double standard medical body which will be fatal to true progress. The teaching is entirely in Spanish with no bilingual requirements, which is a mistake, even though all medical literature is readily translatable into the Spanish idiom. It will take a longer time to teach in English, but the best results for the Filipino people and their future medical profession will be attained in the end.

A subject for consideration for Filipino complacency

is that if they expect to progress and retain what has been accomplished for them, they can do so only by following the example of Japan in her university medical education and never replace a foreign teacher with a native until the native has proved his ability to fill the position by something more than political influence enough to get the job. Japan's secondary medical school system, however, is something to be avoided. Since the Philippine government medical school opened in 1907, about one hundred degrees in medicine have been granted and at a cost of over $150,000 a year. There has been a lack of real appreciation of the imperative needs for modernly educated native medical men so far as any efficient practical method to meet these needs is concerned, such as the stimulating of students to enter the profession. At least one hundred graduates a year from the university school alone should have been going out by the end of 1917, and the standard of the Spanish school could have been raised, had the forces and influences at the command of the government been put in motion to this end. As at present conducted, it would be far better and more economic to send the government school students to the United States for the last two years of the five year course; this would give them the best methods of clinical teaching, the high ideals of modern institutional work and a use of the English language which they are not getting now; something that they could take home and apply in the continuation of their education in their home hospitals to the great advantage of those institutions as well as to the cause of medical education. In addition, there should be established "a material betterment" fund to send abroad at stated intervals deserving young men, teachers and institutional men for the purposes of observation and study. There is no reason why the Filipinos should not take high place in the medical world in less than thirty

years, but everything depends upon adherence to a wise and comprehensive general plan.

As a specific example of general conditions in the Philippines, note the following abstract:

A Medical Survey of a Typical Filipino Country Town of 6000 Inhabitants

In 1909 a body of medical school, health department, and laboratory men spent three months on a medical survey of Taytay, a town of 6000 persons, that had suffered severely from epidemics in the past and was known to be an average insanitary country town. The survey was under the direction of Dr. P. E. Garrison, United States Navy, who suggested the idea, and the scheme might furnish a working model for other tropical countries. The work was done by volunteers during the summer vacation and at very small expense.

The water supply from wells was found to be about as undesirable as possible for community health, but the ground was promising for drilling, and an artesian flow has since been secured. The bacteriologic analysis of the drinking water, made by Clegg, showed from 500 to 12,000 bacteria per cubic centimeter, also bacillus communis, vibrios, amebas and flagellata, while the chemical analysis showed high chlorine figures with an excess of nitrogen in all its forms.

The principal food supplies used were almost entirely local. Rice was the basis of the meal and fish, both fresh and dried, was the second most common food. Pork, the only meat, was for sale on market days; chickens and ducks were abundant and eggs both fresh and incubated (bolut) were somewhat used by the well-to-do classes; various prepared foods were on sale consisting mostly of rice and sugar; also Chinese foods of seaweeds, a spaghetti and mongo beans; wheat, milk, butter and

cheese had no place in the dietary; twenty-five fresh fruits were to be had but only the bananas, mangoes, and pineapples are first-class from an edible standpoint; over twenty vegetables were available but were very inferior and most of them were in limited quantities; of pot herbs and condiments they had six to eight varieties of each. Aron investigated their food from a physiologic standpoint; the daily average amount of rice per person was found to be 700 grams, equaling 50 grams of protein and 2000 calories; fish to 40 grams of protein and 200 calories, and vegetables equaling 500 calories or a total of 2700 calories for an average person, all for an average cost of 12½ centavos a day or 6 cents in U. S. currency. In a provincial town an average native can live very comfortably on this amount, but a hard working man needs at least 25 per cent more food and they are in much better condition with more meat.

Mosquitoes and other insects found by Banks were, 18 species of flies; bedbugs, not common; head lice, which are abhorred by all Filipinos, were universal; fleas made all of the dogs miserable and occasionally annoyed the natives; dog ticks occurred, also caraboa lice which seldom bother men. Ten varieties of mosquitoes were detected.

The vital statistics and the general sanitary conditions were carefully worked out by Clements and are very interesting; the death rate was from twenty-seven to forty-five per thousand.

Garrison examined 17 per cent of the population for intestinal parasites and found ascaris, trichuris, hookworms, strongyloides, oxyuris, ameba, ciliates, flagellates, and encysted protozoa; total infection per thousand, 182; intestinal worms alone, 172.6.

Dr. Bean investigated the racial anatomy and made anthropometric studies.

Of 789 physical examinations made, 558 complained of some disease; disease of the nervous system was found

in 32; of the genitourinary system, 37; tumors, 20; general, 20; alimentary system, 165; respiratory, 135.

Malaria parasites were found sixteen times in 742 individuals in fresh blood smears; no relapsing fever spiro-

Fig. 65.—Symmetrical fibromata (1909). (Philippine Journal of Science.)

chetes were found in any of the fever patients examined.

Filariasis searched for at night was found once in 400 people; about 1 per cent of 800 people examined had tuberculosis; 4 cases of typhoid were found; 11 cases of goiter, all in women; no beriberi, due to the use of unmilled rice; venereal disease and syphilis were rare.

Fig. 66.—Symmetrical fibromata on forearms and ankles. Luzon, P. I., 1909. (Philippine Journal of Science.)

Symmetric subcutaneous fibromata were found in about 3 per cent of women over 30 years of age, either on one or both ankles and elbows; sections showed them to be pure fibromata and some were calcified. (Figs. 65 and 66.)

Fig. 67.—"Fuente," showing ball of wax in ulcer for permanent counterirritation against all diseases, 1909. (Philippine Journal of Science.)

Twenty-one cases of yaws were found after a careful search; several "Fuente" cases were found. (Fig. 67.)

Many maps, illustrations, and disease tables were made and a census was taken. For the complete report, see the *Philippine Journal of Science,* 1901, iv, No. 4.

CHAPTER XI

ANSWERS TO A QUESTIONNAIRE OF FIFTY-THREE INQUIRIES SENT TO COUNTRIES IN AND ABOUT THE TROPIC ZONE

The purely medical responses to the circular request are omitted, but much of the surgical and borderline information acquired, fragmentary as it is, was considered of sufficient value to edit somewhat and present without apologies. Some of this material was published just as it was received, in a Manila medical bulletin which has since ceased publication.

Over two thousand copies of this questionnaire mailed to medical workers in and near the tropic zone in 1911 brought a four per cent response. This would have been highly satisfactory to any commercial advertiser because second and third "follow-up" communications would have increased this percentage considerably; similar improvement could have been expected had this questionnaire been systematically pressed. The most of the answers, however, show that the average of medical men and women in and near the equatorial belt are no better and no worse than their brethren in other parts of the world; that about 90 per cent of practitioners of medicine everywhere, including those in cities, do not record their observations, do not examine their patients in any but the most superficial way, have no proper working library of books and current literature, or do not make their observations and their reading available to themselves or to the world by a simple system of indexing. One man who has been highly honored by his country and profession as a tropical authority since re-

turning home, replied, regretting his inability to answer the questions, that although he had resided in the Tropics for six years, he had not kept any notes. The few good reports are so perfect that they can well serve as models to those tropical workers ambitious to be of real service to the world and to medical science.

Those readers whom these reports will interest, will find much to reflect on, as to the presence of certain diseases in one place and their entire absence or infrequency in another, on the differences in type and severity in countries on the same lines of travel and on the evident fact that diseases known to be due to certain microbic organisms vary greatly in different parts of the world. In a disease, for instance, which is clinically chronic syphilis, gives the specific serologic reaction and yields promptly to antiluetic therapy, no treponema of any sort is discoverable and no primary syphilis develops among the natives or foreigners; the same disease with a treponema in another country manifests itself very rarely in the late forms, but is frequently seen in its primary and secondary stages. Enough was gained by this effort perhaps to warrant a more systematic and sustained attempt to acquire such data. Such an endeavor to be successful should be undertaken by the American Society of Tropical Medicine, as the older tropical organizations, it seems, can not be interested in problems outside of their own colonies.

Races, Physical Conditions, Food and Habits

American Samoa (Cottle.[1])—American Samoa is situated 14° South of the equator. The temperature is very equable, there being a difference of only two or three degrees between day and night and of only eight or ten degrees between summer and winter. The rainfall is often more than 275 inches in the year, yet the degree of humidity is seldom high enough to affect the health. The na-

tives are of the same race as the Maori of New Zealand and the Hawaiian of the Sandwich Islands. About 7000 natives, and 100 Europeans live so isolated from the world—three days of steaming from their nearest neighbors—so unaffected even by temporary contact with other races, that they are remarkably free from the common contagious and infectious diseases that exist in most places in the world. The native eats the cocoanut, banana, bread fruit, and taro, a vegetarian diet, yet one which gives him health and strength and endurance well above the average. Fish, pork, and salt meats are the occasional luxuries added in times of feasting.

An amount of physical labor equivalent to about five hours a week will bring the individual practically all his personal necessities, but his hospitable tastes, further fostered by elaborate marriage, birth, and death customs force the easy-going leisure loving Samoan to hard work and these demands on his energy keep him vigorous, robust, and well-developed. He can row forty to sixty miles a day without fatigue. He can travel miles with a very heavy burden on his back. He can show a surprising energy and muscular endurance in his native dance and can accomplish a great deal of work in the fields. A poor laborer for a wage, he is an excellent worker when getting ready for a celebration. Isolation from contact with the other races, government protection from commercial exploitation, an abundance of good food carefully prepared and well cooked, a good water supply, an agricultural life, well-built houses, an equable warm climate, cleanly personal habits, and a very normal type of sexual life are conditions all of which combine to make the Samoan a healthy animal. Were it not for the presence of a few parasitic and infectious diseases which affect large numbers of the population—one individul often harboring two or more infections—sickness would be almost unknown among them.

GUAM.—Odell,[2] service during 1909-1911. The natives are Chamorros; population about 12,000; American sailors, marines, civil employees and civilians who are permanent residents of the island, number about 250; Japanese, Spaniards, and others number about 100. The American population as to their physical condition, food and habits do not differ to any degree from what they would be in the United States. The native population had been so changed by the admixture of Filipino blood during Spanish possession of the Island that there is great doubt if there now is a pure blood Chamorro left. Today the Chamorro resembles the Filipino. Rice is the main food of the native, though yams, corn, cocoanut, the few fruits native to the island, and the nuts from certain varieties of palm are used to a considerable extent. Fish forms a smaller part of the diet than is common in most tropic islands, owing to the absence of shoals where fish can be taken, and beef is used to a greater extent.

AGRA, INDIA.[3]—Hindus of various castes, Mohammedans, and Christians have been admitted in the hospital for surgical and medical treatment. The general physical condition of about 30 per cent is fair, but that of about 70 per cent is indifferent. The majority enter in advanced stages of disease. A large number of Hindus are vegetarians, but those who eat meat generally take it as an accessory diet. Bread and rice form their chief foods. Among Mohammedans, although all of them are meat eaters, the meat dish forms only an accessory part of the diet, their chief foods also being bread and rice. Indians use a large amount of chilies in their food. They make their food palatable by the addition of condiments, cloves, cardamoms, cinnamon, caraway, asafetida, and a powder made from dried mangoes. The better class Indians use a lot of ghee (liquid butter) and milk with their food. The majority of people, especially among

the poor, take only one principal meal daily about 2 P.M. For breakfast they take a small quantity of parched grain, etc. The better class Indians take two principal meals daily with light refreshment in the morning and afternoon. Hindus and Mohammedans are practically all total abstainers as regards alcohol, though some of the lowest castes drink native distilled liquors in excess.

ZAMBOANGA, P. I.[15]—The general physical condition of Moros is apparently good, but when taken sick they show slight resistance. The Filipino is more resistant to disease, lives better, and is, as a rule, fairly well off. The principal food of all classes is rice and fish. The Moros eat less meat than do the Filipinos. The habits of the Moros are indescribably unsanitary. They bathe occasionally and have no household hygiene. Moros always defecate in water and wash after defecation, using the left hand. The left hand is thus dishonored and is not used in the "chow" pot. As this is their only hygienic practice it does little good, except that the ground around Moro dwellings is not full of hookworm, but the streams are polluted with typhoid, cholera, and dysentery.

SOUTH AFRICA.[14]—Turner[5] dealt principally with the natives from Portuguese East Africa, that is, boys recruited for the mines between Delagoa Bay and Mozambique. These natives may be roughly divided into those coming from south of latitude 22° S., and those from north of that latitude. The former are looked upon as nontropicals, the later as tropicals. The nontropicals consist of four or five well marked tribes; viz., Hangaan, Mtyopi, Inlambane boys, and Delagoa Bay natives, principally Tongas. The tropical natives are a very mixed lot, as may be judged from the wide area over which they are recruited; they vary from Swahili and good class central African Angoni and Jao natives to some very low class tribes on the Zambezi.

West Africa.[6]—Hollenbeck[6] finds the natives of good physique but wholly insanitary; they live on corn meal, beans, meat, fruit and vegetables.

Colombo, Ceylon.[7]—Two thirds of the population are Singhalese, 2,230,897. The rest is composed of Tamils, 951,740; Moors, 228,034; Burghers, 23,482; Malays, 11,902; Europeans, 6,300; other races including Afghans, Kaffirs, Chinese, Japanese, etc., 9,718; Veddahs, 3,971. Of these the Singhalese are of Aryan stock, but mixed with Dravidian stock. The Tamils are Dravidians. The Moors are mostly Dravidians who have been converted to Mohammedanism, while a few claim an Arabian descent. The Malays are Mongolian, the Burghers are descendants of the Portuguese and Dutch settlers. A good number of them, however, are of mixed stock. The merchant, trading and professional classes have a tendency to obesity and a good proportion develop diabetes. The laboring classes are generally thin, but well developed, strong and capable of substantial work. The Singhalese as a rule are inclined to be lazy and will not work unless necessity compels them. The Tamils are more active and industrious. The Moors are generally traders. The Burghers belong mostly to the professional or clerical services, while a good many of them are mechanics. The indigenous population subsists chiefly on rice and curry. The large majority of the Singhalese and Tamils are vegetarians, while those who are in large towns take a mixed diet. Alcohol is consumed largely by residents of towns. The majority of the population practices total abstinence. Opium is very little used, and only by persons who are subject to some chronic malady. Tobacco smoking is very common.

Shoka, Formosa.[8]—Population, 3,000,000 Chinese; 70,000 Japanese; 100,000 aborigines. The Chinese are mostly rice farmers, living among the rice swamps; some of the civilized aborigines come as patients but none of

the wild savages. Many are of Malay stock. The food of the Chinese and civilized aborigines is rice with vegetables, fish and sometimes, though rarely, pork.

KOREA.[9]—Mills and sixteen colleagues. Population, Koreans, 12,000,000; Japanese, 200,000; Chinese, 25,000; Foreigners (Americans, British, etc.,) 400. Classes of patients: Patients treated by us are almost entirely Koreans, the Japanese being treated by their own physicians and druggists. Hospital and dispensary patients are largely from the middle and lower classes, although the aristocrats are frequently reached; women come quite freely to the male physicians for treatment in most stations, especially in the North. Koreans physically are fairly well developed. A recent army examination covering some thousands of men gave a range in height of from 4 feet 11 inches to 6 feet 3 inches. The weight would probably be less than expected from the height. The ordinary coolie often is fairly muscular and larger than the Japanese, but averages less than the Manchurian Chinese. The middle classes, chiefly merchants and shop keepers, are not so well developed and their more sedentary habits have not made them fleshy. The "Yang bans," or aristocrats, are so averse to manual labor and indulge their appeties to such an extent that weak bodies, indigestion, sexual neurasthenia and impotence at an early age are very common. A fat Korean is a rarity although the women are inclined to be a little more plump.

General dietary: Rice and millet are the staples; "kim chee," a kind of sauerkraut composed of native cabbage and turnips with salt, red pepper and other ingredients "to taste" is also widely eaten. Wheat and buckwheat are chiefly used in "cook soo" a boiled vermicelli, while oats and barley are less important. Corn is chiefly eaten off the cob when the "milk stage" is nearly past, and when matured is used only for animals. Beans

are used in a variety of ways and to a considerable extent. Broomcorn is chiefly grown for the seed from which whiskey is made. Dried fish in the interior and fresh ones near the coast are much used, while chickens and eggs are eaten by the better classes. Pork and dog meat enter into the menus of feasts to a considerable extent, and beef, often from worn-out or diseased animals is eaten. While the dietary is perhaps sufficient for the native under his normal conditions, it does not seem sufficient to meet the demands of a more intense life. In the game districts the Koreans eat a great deal of fresh good beef, hare, deer, pheasant, duck, geese and at times horse, donkey, and even leopard. Koreans will not eat pigeon because of an old superstition that there can be but one boy and girl born in the family if they do so.

General Resistance of Patients to Surgical Measures—Shock—Anesthetic Used—Infection of Operation Wounds—Percentage of Aseptic Results in Clean Cases

BURMA.[10]—General resistance to surgical measures is good in natives of a hot climate, but not so good as in Europeans. Chloroform is used. Wound infection seldom occurs and is probably in one respect less likely to occur from hands in this damp, warm climate than in a cool European climate, because constant perspiration makes it easier for the operator to cleanse his hands.

AGRA, INDIA.[3]—The general resistance of the hospital patients is good and, being mostly vegetarians, their wounds heal well. Shock in ordinary operations is seldom observed, but they do not stand the more severe operations, particularly on the abdominal cavity, so well as Western races. Chloroform is almost always used. Infection of operation wounds is rarely noticed, and the

percentage of aseptic results in clean cases is practically 99 per cent.

ZAMBOANGA, P. I.[15]—Moros resist surgical wounds better than Filipinos, but they do not resist medical diseases so well. The Moro is more of a fatalist than the Filipino and, when sick, gives up and dies. Moros with simple diseases will refuse to eat so as to hurry up the end that they are sure is near. The small meat ration of the Moro also undoubtedly affects his resistance unfavorably. Natives are almost immune to pus infection. Have never seen shock in a native during operation. Shock has been seen after severe injuries and in these cases the reaction was satisfactory even though death afterwards resulted. Anesthetic preferred is ether, drop method. Aseptic results are the rule in clean cases.

HONGKONG.[11]—Europeans unaffected by the subtropical climate. Chinese are very susceptible to shock but stand operations under local anesthesia which in the former would necessitate a general anesthetic; sensibility in the Chinese seems not so highly developed as in Westerners. Chloroform is the general anesthetic.

SOOCHOW,[5] PING YIN,[12] AND WENCHOW,[13] CHINA.—The general resistance of the people to surgical treatment is the same as in American hospitals. Percentage of deaths following operation is high, but this is due to coming in a very poor condition to withstand surgical interference. Shock usually is slight. Chloroform is used. Infection is rare in a clean case; iodine solution is used to prepare skin.

SOUTH[14] AND WEST[6] AFRICA.—General resistance of native patients to surgical measure is good; good asepsis in clean cases.

COLOMBO, CEYLON.[7]—As a rule patients stand operative measures well. The laboring classes make better recoveries than others; shock is not marked except in very prolonged operations or in women and children of

a neurotic type. Chloroform is universally used. In weakly individuals A.C.E. mixture is used. Streptococcic infection is very uncommon, and staphylococcic infection sometimes occurs; ninety per cent of the clean cases run an aseptic course.

SHOKA, FORMOSA.[8]—Stand operations well. Do not readily suffer from shock: chloroform as general anesthetic, and cocaine as local: do not use drop method. Operative wounds are rarely infected.

SAMOA.[1]—Surgical patients do very well. Prolonged anesthesia and severe operations seem to be as well recovered from as in the white races in temperate climate; shock is less to be feared than in the white races. Chloroform has been used almost exclusively for the past five years in major cases and ethyl chloride general anesthesia in minor ones without a single untoward effect in the last 500 cases of general anesthesia. Wound infections in clean operations, except of the scrotum, are as rare as in temperate climates.

GUAM.[2]—The Japanese bear surgical operations well. The Chamorros' resistance is somewhat less. Shock is greater than with our people, and seems abnormally so in operations upon the intestines and pelvic organs. This was attributed to the anemia from hookworm infection which is almost universally present in some degree. A rather poor diet was no doubt also a contributing factor. Ether by the drop method was the anesthetic employed, but chloroform had been formerly used to a considerable extent; no deaths had occurred from its use. No infection of operative wounds occurred; cases doing as well in this respect as those operated in the United States. The patients were very tractable when they were in the hospital, being better in this matter than our own people.

KOREA.[9]—General resistance very good. Shock seldom seen. Anesthetic chiefly chloroform, although ether has

been more used in Seoul. Operative wounds, generally clean. Iodine much used in preparation.

The Most Common and Frequent Surgical Diseases

CEYLON.[7]—Inguinal hernia; hydrocele; appendicitis; hemorrhoids.

FORMOSA.[8]—Malaria and its sequelæ, enlarged spleen, anemia; round worms, ankylostomiasis, dysentery.

KOREA.[9]—The most common and frequent diseases are: tuberculosis, syphilis, malaria, chronic gastritis, otitis media, indigestion, bronchitis, and diarrhea.

Climate: Influence on Foreigners and on Natives

BURMA.[10]—Enervating on both foreigners and on natives.

AGRA,[3] INDIA.—The climate is very hot and dry in the summer, and cold and dry in the winter, and it is generally a healthy one. Natives stand the climate well and are usually well nourished and healthy; foreigners also, provided they get their periods of change.

HONGKONG.[11]—Foreigners age more rapidly, especially those addicted to alcohol and sexual excess; presbyopia commences at least three years earlier, ciliary exhaustion and cramp are commoner than in temperate zones among young hypermetropics.

WENCHOW[13] AND PING YIN,[12] CHINA.—Climate has an enervating effect on all foreigners and to a less extent on the Chinese.

CEYLON.[7]—Foreigners generally lose the power of sustained effort and are easily tired after a period of three years. The skin becomes bronzed. Some of those Europeans who have adopted the Ceylonese diet of rice and curry, abstained from much meat eating and either abstained from alcohol or used it moderately, have acclimatized themselves, and lived to good old ages, without visiting Europe.

FORMOSA.[10]—Climate very enervating to Europeans, in summer especially; moist hot climate. Natives are accustomed to it and stand it better.

SAMOA.[1]—Climate alone seems to exert but little effect upon the foreigner. The continued even warm temperature will, after a year or so, cause him to feel slight changes in temperature, which in a more temperate zone he would not notice. For the native the climate seems to be practically perfect.

GUAM.[2]—Climate, the best in the Tropics in that latitude. Daily temperature at noon not high, evenings always cool so that light cover is agreeable. The European who stays two or three years in this part of the world and who protects himself against the fly and the mosquito to a reasonable degree, can work, either mentally or physically, at the same pressure and during the same hours as in a temperate zone. A longer stay, five years or more, will subject him to a real risk of contracting filariasis. The native population seems to suffer more from epidemic asthma during the seasons of greatest rain, July to October.

KOREA.[9]—Climate generally bracing all over Korea. In the winter a little snow and ice in the South with cold winds and gradual changes of temperature. In the North the winds are not severe, the ice on the river reaching a thickness of two and one-half feet. Spring and fall are delightful everywhere. The rainy season is very debilitating in the southern and central portions. Electrical demonstrations in connection with storms are infrequent and accidents of any kind from lightning are rare. Effects upon foreigners: Menstrual irregularities or suppression common; nerve tire; sleepiness during first year common; debility and headaches in the rainy season. As to the latter condition no such marked cases are seen as those commonly denoted "Japan head" so frequent among women in Japan. Diarrhea during first

summer; increased nervousness; some danger of heat exhaustion; rainy season very depressing, the rest of the year exhilarating. Hard work in this beautiful and bracing climate seldom hurts any one. Effect upon natives: Koreans in the North are observed to be taller and of a sturdier, more reliable character than those in the South. The colder the climate, the more the people crowd together in small houses with all the evils arising from such conditions. Exposure to the cold and rain with insufficient clothing leaves its impression. It is said that tuberculosis is more prevalent in the South where the climate is more mild and exposure not so great.

Europeans: Habits, Exercise, Periods of Service, Prevalence Among Them of Diseases of Hot Regions

BURMA.[10]—Climate, temperate and regular; active exercise the rule. Leave of one year should be given every three years. After a stay of three years in the climate of Burma, resistance to tropical diseases is much lower and their prevalence becomes marked.

MANILA.[15]—Habits and exercise should be adjusted for the good of each individual and no hard and fast rules can be laid down. The enlisted men and most line officers take considerable exercise and benefit thereby. American women almost universally take practically no exercise in the Philippines and this, combined with a too strenuous social life for many who live in Manila, is, we believe, the cause of a large number of cases of tropical neurasthenia. The main habit to be avoided is an undue use of alcohol, the effects of which are the same here as elsewhere. For various reasons there is a tendency to use more alcohol here than at home. There is also a tendency to avoid taking a sufficient amount of exercise because of the heat. The prevalence of "tropical diseases" depends upon the habits of life and hygienic surroundings. With proper care they may all be avoided in most

instances. The tour of duty at present in force for the army is two years. This we believe to be a suitable one when all factors are considered.

AGRA, INDIA.[3]—Europeans live very abstemious lives nowadays, take little or no alcohol in the hot weather, and live sparingly. All the year round exercise is taken daily, and Europeans find it necessary to have the relaxation, especially those whose work is continuous and hard. Exercise takes the form of riding, e. g., polo all the year round, pig sticking in the hot weather, tennis, racquets, and golf all the year round, cricket in the cold weather, football and hockey also the year round. The usual full period of service for pension is thirty years, but pensions can be taken after twenty and twenty-five years. Government servants are forcibly retired at 55 unless above a certain rank which only a small percentage attain. The period of leave of absence to England is usually one year in five, but the average amount of leave taken is not so much as this; usually about eight months leave home in five years. At the present time with the healthier conditions of life in India "tropical" diseases are very much less common than they used to be. Cholera and liver abscesses are rare among Europeans; dysentery is seen, but is chiefly of a mild type and malaria is far less common than it used to be.

HONGKONG, CHINA.[11]—In at least 50 per cent there is tendency to drink more alcohol than is good for the human body without going so far as to term this alcoholic excess. Exercise: Every variety of game is indulged in. As a rule five years of service is required by the majority of firms and then one year's leave.

SOOCHOW, CHINA.[5]—Out of doors a great deal. About a seven-year service and one-year furlough. Malaria is very common, tertian and subtertian. The usual intestinal parasites are very common.

CEYLON.[7]—Europeans, as a rule, go in a good deal for

horse riding, cycling, golf, tennis and cricket, but unfortunately a good number of them take whiskey in excess, particularly after exercise. Generally they go on leave for a period of six months to a year after every five years. Enteric fever, dysentery, diarrhea, and sprue are some of the common tropical diseases to which they are subject.

FORMOSA.[8]—Europeans vary much in regard to exercise and habits. The tendency is to live too well and take too little exercise. Missionaries serve from five to seven years and then take a furlough for a year or more. Europeans suffer from malaria and dysentery, not so much from malaria now that their houses are mosquito proofed.

GUAM.[2]—Europeans exercise less, and consume more alcoholic beverage than they would at home. The period of military service is about two years, and during that time the enlisted personnel and officers have one or two trips to Japan or China for change. Civil employees and residents do not go away as a rule. Some of the permanent residents have been there for years without any bad effects. Dengue, furunculosis, dysentery, and tinea are seen. When an epidemic occurs, practically all of the people who have not had dengue have the disease. Tinea is not so prevalent as it was in the foreign population in the Philippines ten years ago, but is frequently seen. Furunculosis is fairly common. Dysentery is not very common owing to the care exercised in diet and the general use of distilled or boiled water. The American population is more free from the ailments common among the natives because of the care taken with diet and a better hygienic life. No case of epidemic asthma (guha) was seen in the American population.

KOREA.[9]—Effects on foreigners: Menstrual irregularities or suppression; sleepiness during the first year. Foreigners are chiefly Americans. Habits not specially

different from at home. Furlough periods for missionaries are every six to eight years. Tropical diseases among foreigners are found only in the South. Sprue: several cases; diagnosis complicated by a similar symptom-complex in nursing mothers that clears up on weaning the child. Dysentery: a number of cases, followed by liver abscess after a few. Malaria: very common in former times, less so now, but still fairly common in more southern parts. Relapsing fever: several cases, especially among physicians. Typhus fever: no cases for several years.

Wounds: Infections, Pathogenic Causes, by Streptococcus, by Staphylococcus, by Tetanus, Etc., Native Treatment of Wounds

BURMA.[10]—Wound infections are not marked. Chief infection by staphylococcus. That by streptococcus rare. Tetanus practically nil, since routine use of antitetanic serum in all dirty wounds; but in dirty wounds treated in native houses this infection is common, much more so than under somewhat similar surroundings in Europe.

AGRA, INDIA.[3]—Infections of wounds by streptococcus, staphylococcus or tetanus are frequently seen in the outpatient room; especially in compound fractures. These cases are dressed with mud, cow dung or any filthy rag and after some days brought to hospital. It is always necessary in large Indian hospitals to have separate septic wards for such cases and amputation of limbs is very frequent.

WENCHOW[13] AND PING YIN,[12] CHINA.—Wound infections by tetanus and other pyogenic bacteria are common.

CEYLON.[7]—Knife wounds are fairly common. Blows with clubs and fists are few in proportion. Staphylococcic infections are more common than streptococcic infections. Tetanus occurs in association with lacerated

wounds, compound fractures, and sometimes in cases of small wounds caused by the mid-rib of a cocoanut leaf.

FORMOSA.[8]—Wound infections by both staphylococcus and streptococcus are very common. Tetanus is not uncommon. Tobacco is a favorite application to wounds.

NATIVE TREATMENT OF WOUNDS AND DISEASES

BURMA.[10]—Native treatment of wounds and diseases crude; largely by charms, actual cautery, and leaves of sacred trees.

PING YIN,[12] CHINA.—Native treatment of wounds is by application of flour, ashes, earth, etc. Boils, abscesses and all swellings and painful areas are treated by application of adhesive plaster. Acupuncture most frequent method of treatment. Other methods of treatment are pinching, bruising, thumping and the cautery.

CEYLON.[8]—There are three systems of native treatment; viz., the Singhalese, the Tamil, and the Mohammedan. Some of these native practitioners have acquired local fame in the treatment of particular diseases. The native treatment of wounds, fractures, and sprains appears to have given satisfaction; from personal examinations of some of the medical cases treated by native practitioners, I must admit that the results have been satisfactory. They generally use medicinal herbs and pastes made of leaves, but the composition of their oils and pastes is kept rigidly secret and is handed down from father to son. In the treatment of dysentery both acute and chronic they are very successful. Hysterical disorders are also successfully treated by them and there are a few who have a reputation for the cure of snake bite.

SAMOA.[1]—Wound infection is the rule unless the wounds are cared for surgically; staphylococcus aureus being the most common; streptococcus rare. Tetanus has been observed but is very rare. The natives treat a wound

by neglect until infection occurs and then by bathing it in the sea. At a later stage when healing has begun, the wound is sealed with leaves to keep out flies and dirt. The native treatment of other diseases is largely confined to what they call "lumi lumi," a well-developed form of general massage, at times gently used so as to give relief to the patient, at other times administered with sufficient force to do harm. Not infrequently abortions are brought on in this way.

GUAM.[2]—Wound infections were fairly frequent among the natives owing to the filthy dressings applied at the time of injury and the time necessary to convey the patient to the doctor, as the injuries generally took place on the ranches some miles from Agaña where the hospital is located. It was surprising how frequently clean results were obtained in serious wounds, gores from bulls and the like, that were fairly common and where the wound had every opportunity for infection. Streptococcus infections were not common; staphylococcus was the common infecting agent and pyocyaneus infection was more frequent as an accompanying infection than in any other place that I have observed. Tetanus was fairly frequent in punctured wounds and tetanus neonatorum was common in Agaña until the first of 1912 when the old system of midwives was abolished. Natives have no treatment for wounds different from that among our own people.

KOREA.[9]—Native treatment of wounds and diseases: Cover with hard dressings, hot dressing, chicken split open, soot, pitch plaster, dog manure, occlusive dressings, oil-paper, mud, cow manure to cervical adenitis and cuts, fresh dog skin, tobacco leaves, lime, salt, boiling oil, bird dung for eczema; some use starch paste or cobwebs in early stages and later, leaf poultices or black wax; kerosene has been used lately. Urine serves as an eye wash and for wounds on horses; wounds with hem-

orrhage are bandaged with leaves or sometimes a plaster of pitch; a constriction bandage is used for snake bite; contusions are treated with mud or occasionally with dung; splints for fractures are bound with excessive tightness. Cauterization of sacral region is done for malaria, of the anterior fontanelle for convulsions in children, of the protruding parts for uterine prolapse; moxa is also used; acupuncture is done for rheumatism, neuralgia, joint affections, and all sorts of pain. Mercury vapor inhalations are used for syphilis, often resulting in salivation. Hot sweat baths, counterirritation and blood-letting, (short needles repeatedly applied) and sulphur baths for scabies are some of their treatments. Among the variety of internal medicines are ginseng, deer's horns, tigers' bones and teeth, urine of a baby, dog meat soup, and one case is reported of the menstrual blood of a virgin being prescribed for a sick young man. Santonin and quinine are coming into common use. All medicines are taken in great quantities and very largely diluted. Many cases of ordinary sore throat, tonsillitis and enlarged tonsils are thought to be specific and great harm results from the application of the yellow oxide of mercury locally and in the nose, as well as the inhalation and the insufflation of other compounds.

The practice of medicine in Korea is largely borrowed from China although a great many of the medicinal plants are gathered on the hills. The treatment is chiefly symptomatic and the "shot gun" prescription is found at its worst. To say that all such medication is inefficient or harmful would be carrying the matter too far. Acute gastritis and the malnutrition of infants react very unfavorably under this treatment while "indigestion" does as well on such decoctions as on any other line of treatment so long as the patient himself will not or can not remove the cause. Acupuncture with the long needle has

resulted very disastrously in many bone and abdominal cases and the absence of such results in thousands of other cases must be due to the special dispensation of a kindly Providence and an acquired immunity to ordinary pus infections.

Dr. Stryker of Pyeng Yang adds the following: after injury from a fall, the Koreans drink dog's dung mixed in water; to prevent poisoning, drink their own urine; for inguinal adenitis, apply nicotine from pipe, scratch with dry snake tail, apply hot rice poultice; fistula-in-ano, apply hot iron; sore eyes, apply nicotine, snakes' gall or small piece of gold to eyelid; boils, oral suction, soot, bear's grease; hemorrhages, hot candle grease, hot ashes, dyes; dysentery, rice powder and water, acorns powdered with honey, yellow pine tree flowers powdered and mixed with honey and soot; diarrhea, dried vermicelli and thick wine, red bean candy boiled in wine; indigestion, strong salt water, bean sauce; during rainy season, water dripping from an old straw roof; bronchitis, vinegar, raw pear with pepper (cook and eat hot), honey and pork; dropsy, fresh bull skin and lie in it on hot floor, pig's grease applied to body; typhus fever, eat barley gruel, white dog's dung soaked in water and used as a drink, virgin's menstrual blood soaked in water and used as drink; malaria, make patient walk during chill or face sun and bleed from nose with needle, or scare patient while in chill by means of snake, etc.; tapeworms, eat acorn nuts one handful; round worms, drink boiled castor oil; stomatitis in children, white dog's dung powdered and put in mouth, also hot dog grease; pulmonary tuberculosis, drink human blood, eat raw placenta; gonorrhea, vermicelli water, swallow dung mixed in water, hot steam locally; syphilis, inhalations of powdered mercury; tuberculous glands of the neck, musk powder; eczema, man's hair, oil, and dust from a high shelf mixed and applied; to prevent abortion, take a piece of wood

from handle of a well bucket, burn and dissolve ashes in water and drink.

The Most Common and Frequent Diseases

BURMA.[10]—Tuberculosis.

AGRA, INDIA.[3]—The disease for which during the whole year there is the largest hospital attendance is malaria, otherwise there is no specially prominent disease.

SOUTH AFRICA.[14]—The most common disease varies according to the locality. On the Transvaal Gold Mines pneumonia causes more trouble among natives than any other disease. Cerebrospinal meningitis occasionally occurs in epidemic form among natives. Spirillum fever, the result of the bite of Arnithodoran Montata, is prevalent in places; malaria is universal in the low ground and causes invalidism among natives during childhood and early youth.

HONGKONG,[11] WENCHOW,[13] CHINA.—Europeans: gonorrhea and abdominal complaints. Chinese: trachoma, syphilis, tuberculosis, intestinal parasites, malaria, dysentery.

CEYLON.[7]—The most common and frequent surgical diseases are inguinal hernia, hydrocele, appendicitis, hemorrhoids.

FORMOSA.[8]—Malaria and its sequelæ; enlarged spleen and anemia, round worms, ankylostomiasis, dysentery.

SAMOA.[1]—There are several very common and frequent diseases which are given below with a rough, but accurate, estimate of their frequency in the population. 1. Nematode infections: ascariasis, about 80 per cent of native children; uncinariasis, about 90 per cent of adults; trichuriasis, about 70 per cent of adults; filariasis, about 50 per cent of adults over thirty years. 2. Treponema infections: frambesia, yaws, all native children have it, have had it, or will contract it. 3. Eye infections: (a) acute diplococcic conjunctivitis, affects whole villages if

not controlled: (b) chronic granular conjunctivitis, 30 to 60 per cent of children are affected. 4. Skin infections: trichopyhtosis corporis, about 40 per cent of adults; chromophytosis, about 40 per cent of adults. 5. Common surgical conditions: deep abscesses, large ulcers, and elephantiasis.

Guam.[2]—Americans: dengue, dysentery and furunculosis. Chamorros: worm infections, hookworms, ascaris and whipworms: dysentery and intestinal infections of children, tuberculosis, epidemic asthma (guha), syphilis (gangosa), pneumonia, and leprosy.

Malaria

Malaria is possibly the most important disease of the world in general, and Ross'[15] statistics show that it is the most important disease of the Tropics. As a rule about one-third of the population of malarious countries suffer from attacks every year, even 100 per cent of the children of very malarious regions may show either parasites or splenic enlargement. While the case mortality is only about 0.5 per cent, the total mortality runs from 10 to 15 per 1,000: in India it is estimated that malaria is responsible for about 1,300,000 deaths each year. Again, malaria so complicates other diseases that, especially in surgical cases, one must be prepared for the possibility of an explosion of latent malaria following the trauma of an operation, as is also the case at times in chronic alcoholism and syphilis. Ten years after the discovery of the cause of malaria by Laveran (1880), we were in the dark as to the method of transmission of the parasite and it was not until 1899 that Sir Ronald Ross proved the mosquito transmission for man, which was subsequent to the Italian experiments in 1898. Ross observes that although fifteen years have elapsed since the knowledge of the mode of transmission of malaria was obtained, yet not more than one-tenth of the im-

provement of health has been effected which was possible of accomplishment had mankind put its heart into the problem of malaria eradication.

Malaria: Prevalence as Shown by Blood Examinations; Fever Due to Malaria Following Operations

AGRA, INDIA.[3]—Malaria is the most prevalent disease in India and has for the whole population a heavy death rate either directly or indirectly as complicating other diseases. It is most prevalent in the months of July, August, September, October, and November, that is, in the months of the rains or just following the rains. The amount differs from year to year. Given good productive years with cheap food and the general population in healthy condition and normal rains, there is not usually an excessive amount of malaria; but given bad years, foodstuffs scarce, famine and poor nutrition, and heavy rains on the top of this, malaria is usually excessive and has a high death rate. Owing to the measures being taken all over India in combating malaria, it is being gradually reduced and with improved sanitation, better drainage, the prophylactic issue of quinine and the education of the masses it is hoped to greatly lessen the amount of malaria year by year. We do not find malarial fever as a rule complicating operations very much. In our Agra experience it is rare.

HONGKONG, CHINA.[11]—Extremely prevalent; chiefly benign. However, malignant tertian forms are not uncommon after operations and after confinement.

AFRICA.[6, 14]—Have no European patients. The adult native who has been reared in a fever district appears to have acquired a certain immunity to malaria and is but rarely troubled with it, a native from a nonfever district, however, is just as susceptible to fever as a European if exposed.

CEYLON.[7]—Malaria is uncommon in Colombo. It is

very common in outlying districts: have very seldom seen malaria after operations.

FORMOSA.[8]—Very prevalent. Estivoautumnal, tertian, quartan, all common. Parasites easily found in the blood; no doubt the fever that occurs after operations sometimes is due to malaria.

KOREA.[9]—Malaria very frequent (microscopic diagnosis): in about 40 per cent of the children, microscopic diagnosis in doubtful cases: none seen, clinical or otherwise in Kangkai which is in the extreme North among the mountains. The widespread use of quinine has resulted in a great decrease in the prevalence and severity of the disease.

SAMOA.[1]—Malaria does not exist in Samoa nor has careful search revealed the presence of any species of the family Anophelinæ.

GUAM.[2]—No malaria exists on the island.

Prevalence of Opium or Other Drug Habits and Alcoholism

BURMA.[10]—Opium eating is prevalent among the lower class Burmans and Chinese in the larger towns. The cocaine habit is becoming so among the same classes. Alcoholism is not prevalent. Morphine is largely administered by injection. Opium and cocaine by the mouth.

INDIA.[3]—After the age of forty a small percentage of the people become addicted to taking opium. They generally start the habit for the cure of certain diseases such as chronic diarrhea, asthma, bronchial catarrh and diabetes. Opium is frequently given to children to quiet them. The tobacco habit is general. Bhang is generally used by higher castes especially Brahmans. Alcoholism: People generally are sober. Among the lower castes the habit is more general. Among the educated Indians the habit is increasing.

HONGKONG.[11]—Opium habit distinctly on the decline among Chinese; alcohol on the increase.

SOOCHOW,[5] PING YIN,[12] CHINA.—Opium habit is the curse of the people but no worse than in any other place in China. It is easy to break the average smoker by substitution of another form and gradually reducing. We have over thirty of this class in our wards all the time now. Alcoholism is quite common.

AFRICA.[14]—Cannabis Indica, native name "Dacha," is smoked by many tribes; no reports of opium being used.

CEYLON.[7]—Opium habit is not very common and only occurs among people who are suffering from some incurable chronic maladies such as inoperable cancer, diabetes, etc. A certain proportion of people suffering from gallstones, and stones in the kidney, who refuse operative treatment also take to it. Alcoholism is common among the laboring classes and chiefly in large towns. It is also common among the well-to-do classes.

FORMOSA.[8]—Opium smoking is very common. Also some morphine victims who use the hypodermic syringe. Alcoholism is not very common among the Chinese. The Japanese and also the aborigines are fond of the bottle.

KOREA.[9]—The Korean medical association called attention to the prevalence of the opium habit in Korea and that, contrary to law, there was known to be a good deal of traffic in this drug carried on by druggists of various nationalities. This was officially presented to the government in Chosen and was favorably received. Formerly very rare, recently fairly common. Alcoholism generally stated as moderately common, excessive drinking is not the rule. Reid adds and several confirm that drinking is more prevalent among the farmer class; he probably means "plain drunks" on the street. Curell estimates that 60 per cent of men drink to some extent and adds that liver complications are rather common; others report liver cases.

SAMOA.[1]—Alcoholism among the natives is practically unknown. A law of the land prohibits the sale or giving of alcohol to the native and it has been well enforced. Drug habits are practically unknown in this little community because of a law which forbids the importation of drugs or patent medicines except by express written permission of the medical government; a law which is capable of great good in any community.

GUAM.[2]—There is no opium or other drug habit in the native population, and the importation of drugs is under the supervision of the health officer of the island. The natives drink "tuba," the sap from the buds of the cocoanut tree; this is generally allowed to ferment, but at times is taken before fermentation takes place. The use of "tuba" is common. There is also a certain amount of distilling of the fermented "tuba" going on, but this is prohibited by the government and those engaged in the manufacture are punished when detected. The use of this spirit is not very general. There is some use of beer, whisky, and gin, but the amount is not great and the native can be called a temperate individual.

Surgical Tuberculosis: Pulmonary, of Bones, Joints, Tendons, Peritoneum, Skin, Genitourinary Organs and Intestines; Frequency of Pott's Disease; Public Antituberculosis Measures

BURMA[10] AND AGRA,[3] INDIA.—Tuberculosis of all tissues except the skin is not uncommonly met with. Pott's disease is rare. Lupus is practically unknown. Tuberculosis of the testes is rare. Tuberculous diseases of the intestine are probably much more common in natives than in adults of European countries and appear to be on the increase. Pulmonary tuberculosis is common and is certainly on the increase. Tuberculosis of bones and joints also is very common and roughly accounts for about 20 per cent of the admissions on the surgical side.

Tuberculosis of the genitourinary organs forms about 1 per cent of the admissions in the hospitals.

SOOCHOW[5] AND PING YIN[12] AND WENCHOW,[13] CHINA.—Tuberculosis is the most common of all diseases and the curse of the country; there is no form but what is met with. Patients respond well to modern treatment, but this can not be given to every patient.

AFRICA.[6-20]—Pulmonary tuberculosis common among natives living in proximity to Europeans. Whether Pott's disease is common or not is doubtful. It is probable that a deformed child would be destroyed, if living in outside districts.

CEYLON.[7]—Pulmonary tuberculosis is common among the poorer classes in towns. Tuberculosis of the bones, joints, tendons, peritoneum, skin, genitourinary organs, and intestines is very uncommon; not more than two or three cases of each are seen during the year.

FORMOSA.[8]—Tuberculosis very common, especially pulmonary. Tuberculous cervical glands very common. Not very much tuberculosis of bone and joints nor of tendons. Lupus not seen. Tuberculosis of the cecum is not infrequent; is often associated with chronic intussusception which is operated upon. Pott's disease is very common. Tuberculosis of the testes, epididymis, vas deferens, prostate, and bladder occasionally met with.

KOREA.[9]—Surgical tuberculosis: tuberculosis of all kinds is quite common, especially of bones. Many of the cases had sequestra. Joints: no definite pathologic studies have been made, and, while tumor albus is fairly common, the later stages are masked by the secondary infection incident to acupuncture. Tendons: no report. Peritoneum: many cases seen. Skin: some cases recognized and probably a good many overlooked. Pott's disease: quite frequent. Cervical and axillary adenitis: abundant; many of these patients have large tonsils.

SAMOA.[1]—Pulmonary tuberculosis exists in American

Samoa, about twelve cases having been diagnosed in the past year when about three thousand cases of disease were seen. No bone tuberculosis was observed during this period; two healed joint cases were seen; five tendon sheaths, probably tuberculous, were operated on. Tuberculosis of the genitourinary organs and of the intestines, was not recognized. Pott's disease is present, about twenty old cases being scattered through the population. Tuberculous glands of the neck are quite common; there were six operations for this in the last 500 operations performed.

GUAM.[2]—Pulmonary tuberculosis is very common and fatal. Knee-joint involvement is frequent in children; no cases were seen in adults. The treatment by rest, hyperemia and good food gave excellent results in the hospital. Tuberculous involvement of the vertebræ and of other bones and joints was remarkably infrequent; no new cases were seen and there were but few old cases seen on the island. Peritoneal tuberculosis was not common. Intestinal tuberculosis was frequent in children and there were great numbers of cases of involvement of the mesenteric glands. Cervical glandular disease was common in young adults and children.

Kala-azar

BURMA.[1] Kala azar is practically unknown. It is met with from time to time, but no properly investigated case occurring in a native of Burma has yet been reported. All the cases seen here have probably been imported cases from India or Assam.

HSI YEN, CHINA.[3] Infantile type of kala-azar is exceedingly common. Have not looked for the Leishman-Donovan bodies but the cases agree closely in all their characteristics with those described by one mission doctor [illegible] by Dr. Graham Aspland, by whom they have been examined. (See *China Medical Journal*, May, 1911.)

SAMOA.[1]—Kala-azar is not found.

GUAM.[2]—Kala-azar does not exist.

Syphilis: Results with Ehrlich's "606" Treatment

BURMA.[10]—Syphilis very prevalent. Ehrlich's "606" has been tried on a small scale with no very gratifying results, as regards establishing immunity from the later effects of syphilis.

AGRA, INDIA.[3]—Syphilis is fairly common and forms about 20 per cent of the admissions to the hospitals. The majority of cases come during the second stage and third stage of the disease; with Ehrlich's "606" treatment the sores heal more rapidly; the Wassermann reaction is sometimes negative after one injection, but always negative after two. We combine the treatment with mercury internally. We have seen no ill results from it.

HONGKONG[11] AND PING YIN,[12] CHINA.—Syphilis is very prevalent; 606 treatment a great help, but not absolutely curative.

COLOMBO, CEYLON.[7]—Syphilis fairly common among the town population; used 606 in thirty cases, with very gratifying results. Treatment with mercury has been continued; the results have been particularly satisfactory in phagedenic ulcerations, bone pains in joints, and on secondary eruptions.

SAMOA.[1]—Syphilis is not present. A few cases came to the port three years ago, but were deported before causing any spread of the infection. A few cases of late and of hereditary syphilis have been seen, but these were in cases where the original infection could be traced to some other island.

KOREA.[9]—Many cases of syphilis are seen.

GUAM.[2]—No primary syphilis was seen and none exists on the island. There is an old syphilitic infection which is very common, "gangosa." Treatment with salvarsan was started in June and had not been carried far enough to make a report.

Typhoid: Complications, Percentage of Perforations, Peritonitis, Osteomyelitis, Parotitis, Operations Made

RANGOON, BURMA.[10]—Typhoid fairly common among Europeans and natives of India and Burma. Mental affections have been noted as a not infrequent complication in natives. Percentage of perforations is higher among natives than Europeans owing to former seeking medical aid late. Osteomyelitis and parotitis uncommon. If perforation is recognized early enough, laparotomy is performed; successful cases practically nil.

MANILA.[15]—For some years after the American occupation it was thought that typhoid was unusual in the Philippines. It has been recognized, however, by army surgeons in practically every island in the archipelago. This board has been working on the subject of typhoid for two and a half years and has come to the conclusion that typhoid is common and ever present among both Americans and natives and is probably more prevalent than it is in the United States. We have investigated many epidemics. A great many cases of typhoid in the Philippines, both among natives and whites, are mild and atypical and can not be recognized except by laboratory methods. The mortality, of late years, when good facilities are available, is no higher than in the United States, or about 7 per cent. Our experience with paratyphoid is limited to two cases in which we isolated the organism from the blood. About 15 per cent of Philippine typhoids have hemorrhages, probably due to intestinal parasites.

AGRA, INDIA.[3]—Typhoid is common among Europeans in India, but rare among adult natives. It is becoming less common among Europeans as more precautions are taken. Antityphoid inoculation and the isolation of "carriers" have done much to lessen its frequency. Among complications, perforation, peritonitis, osteomyelitis, and parotitis are rarely seen. Hemorrhage is

more common, and so are thrombosis and periostitis.

HONGKONG, CHINA.[11]—Cholecystitis, gallstone and biliary sand not uncommon after typhoid. However, this disease is not very common in Hongkong unless imported, and is mild in type.

COLOMBO, CEYLON.[7]—During 1912 two cases of typhoid perforation were operated on and recovered; no statistics of the general prevalence of typhoid fever and its complications available.

SHOKA, FORMOSA.[8]—Typhoid is fairly common. Have seen severe hemorrhage from the bowel; one case of perforation operated on unsuccessfully.

SAMOA.[1]—Typhoid is not present.

GUAM.[2]—There is no typhoid on the island.

Dysentery: Amebic, Bacillary, Perforation of Intestine, Peritonitis; Hemorrhage from the Bowel. Appendicitis: Operations for, Results. Appendicostomy: Is Dysentery Becoming Less Frequent and Less Serious Under Modern Conditions? Relative Percentage Among Natives and Europeans

RANGOON, BURMA.[10]—Dysentery is one of our commonest diseases and has a prominent place in all death statistics of Burma. Both amebic and bacillary dysentery are met with, the former being the more common. Under the head of bacillary dysentery it is almost certain that more than one disease is included at the present time. Among the cases described as dysentery are many cases of ulcerative colitis which are probably neither amebic nor bacillary dysentery; such cases are very frequently returned as "chronic diarrhea," owing to their prolonged course and slight clinical evidence of ulceration of the large bowel. At autopsy, the ulcerations found are usually very shallow and are very minute though numerous.

AGRA, INDIA.[3]—Dysentery is common in India, but un-

der modern conditions we do not see as many serious cases as formerly. In the mild cases the saline treatment (magnesia sulphate) is the most satisfactory, and the ipecac treatment in the more serious cases. Have not seen appendicitis as a complication and have performed appendicostomy. It is more common among natives than Europeans, but it is much less common than formerly among native troops and prisoners owing to the improved sanitary conditions. It is rare to see a severe case among the better class of Europeans.

HONGKONG.[11]—In private practice at least 90 per cent of the dysentery seen is amebic. The routine treatment is salines by mouth and quinine, nitrate of silver, and boric acid injections per rectum given in the genupectoral position. In relapsing cases of amebic dysentery salines often fail and ipecac is then given. Appendicitis is common after any affection of the colon; have had no cases suitable for appendicostomy.

WENCHOW[13] AND PING YIN,[12] CHINA.—Dysentery exceedingly common, endemic most of the year and epidemic each summer and autumn. Whole villages often carried off by an epidemic. Diet, albumin water. Ipecac gives the best therapeutic results when properly administered. Rectal injections of quinine also valuable. Perforation, peritonitis, or severe hemorrhage in dysentery not seen.

COLOMBO, CEYLON.[7]—One case of appendicostomy in a very severe type of bacillary dysentery where antidysenteric serum had been tried without benefit. Although the patient was relieved of the more urgent symptoms, he died from symptoms of septicemia on the third day. In three cases of chronic colitis appendicostomy was done with good results. Have never seen perforation dysentery, nor appendicitis following dysentery. Dysentery is more common during the dry seasons following wet weather. It is more common among natives, but Europeans have a more severe type.

SHOKA, FORMOSA.[8]—Dysentery very common; both amebic and bacillary; treatment by salines preferred to ipecac or calomel; few of the complications except stricture of the rectum in one child; appendicostomy not tried. With our new water supply dysentery is becoming much less frequent; next to malaria it is perhaps the commonest disease.

SAMOA.[1]—Dysentery is common; type bacillary, exact organism not determined. Amebas have not been found. Predisposing causes seem to be mainly ingestion of decaying food or too great an amount of food during times of feasting. Two clinical types: first, semiacute, ten stools a day, slight amount of blood, well in a few days after simple catharsis and starvation, by far the usual type; second or blood type, twenty stools a day, pain, tenesmus, blood, pus, mucus, sometimes almost pure blood in considerable quantities, prostration moderate. These cases get well two to three weeks after administration of ipecac in large doses. The European is careful of his diet and practically never contracts either form of dysentery. The European who lives with the native is liable to the same forms. Death from this cause alone is very rare in cases treated, but in cases left to the native doctors death is common, for they insist upon feeding their patients. They believe that frequent stools demand frequent feeding.

KOREA.[9]—Amebic dysentery is not uncommon and diarrhea of other kinds is very common in the summer time. Weir has made definite search for the amebas and has found them in a few cases. Hospital practice in Seoul shows quite a number of liver abscess cases; other complications infrequent; appendicitis rare.

GUAM.[2]—No bacillary dysentery on the island. Amebic dysentery is common. The number of cases of amebiasis having dysenteric symptoms is not relatively very great. The incidence of dysentery is much reduced since the

introduction of a water supply and the closing of the old surface wells. The infection is not of a severe type and seems to be growing milder. The ordinary ipecac and opium treatment was the routine and the results generally were good; in some of the more severe cases irrigations with quinine also were given, and cures generally resulted. Eight appendicostomies were made with perfect results in six cases; one was improving when last seen; one case died, as the disease was too far advanced to expect any other result. Appendicostomy or cecostomy as the operator may desire is of the greatest value and amebic dysentery in certain cases becomes a surgical rather than medical disease. After a patient has had medical treatment for a reasonable length of time without good results, appendicostomy should be made and soon enough to prevent the development of ulcerative conditions that are sure to produce permanent injury to the bowel; several cases in the service in which the ordinary medical treatment was of no apparent value and where the symptoms suggested liver abscess cleared up perfectly after appendicostomy was performed. No cases of perforation of the intestine were seen. Hemorrhage from the bowel was at times fairly severe but in no case dangerous. No peritonitis or appendicitis was seen that was due to ameba. The disease is very much more frequent among natives than Americans owing to the precautions taken by the latter. It is difficult to state percentages, but relatively not one case occurs in the American to ten in the native.

Intestinal Parasites and Intestinal Worms: Have Systematic Examinations of the Stools of the Natives in Large Numbers and in Different Places in the Country Been Made?

RANGOON, BURMA.[10]—Intestinal worms are very frequent. No systematic examinations have been made.

Round worms in fair numbers are almost always present in Burmese; one or two cases of intestinal obstruction caused by large masses of these worms have been met with. Ankylostoma infection of a minor degree is very common. Tenia infections are rare.

SWEBO, BURMA.[18]—These observations were made on prisoners and also from those attending in the hospitals. They are all male adults. Out of 2000 cases examined parasites were found in 1048 of them, giving a percentage of 52. Of these 257 were ankylostoma duodenale, 253 ascaris lumbricoides; 243 trichocephalus dispar; 170 rhabdonema intestinale; 89 ameba coli; 29 oxyuris vermicularis; 5 tenia saginata and 2 were tenia solium. Results with santonin on 100 new admissions into jail: Each prisoner who was in good health when he was admitted into the jail was given santonin, 5 grains, followed by a saline purge. Of these 82 per cent had worms, 51 of them passed 2 worms each, 12, 1 worm, 11, 3 worms, and 8 passed 4 worms. The longest of these worms was 14 inches, and the shortest was 6 inches. The average was 9 inches. Results with 100 old admissions in the jail: With another 100 prisoners already in jail and selected from a healthy set of men, I obtained the following information. Of these 89 passed worms, 30 of them passed 1 worm each; 26, 2; 18, 4; and 15 passed 3 worms. The longest of the worms measured 15 inches (female) and the shortest 4 inches (male). The average, 7 inches. Results with 500 prisoners: Fifty prisoners were selected from time to time from the different sections in the jail. The observations extended over a year and the results were as follows: 109 passed worms, 38 of them 1; 27, 2; 22, 3; 6, 4; 6, 5; 5, 6; 3, 9; 1, 7; and one passed 8 worms. Remarks: These observations show that ankylostoma duodenale was the most prevalent, then ascaris lumbricoides, then trichocephalus dispar and then rhabdonema intestinalis. The large number of ankylostoma passed

was due chiefly to the climate, which was exceedingly damp throughout the year, but especially during the rains. The prevalence of ascaris lumbricoides and trichocephalus dispar requires no comment as they are very common in the Tropics. Rhabdonema intestinalis is not uncommonly found in the Tropics: these parasites were most prevalent at the end of the rains, September and October, and then during the rains, July and August.

SHOKA, FORMOSA.[8]—Intestinal parasites and worms exceedingly common. Amebic, malarial, and bacillary dysenteries are all very common. Ascaris, trichuris, hookworm, oxyuris are common; only one case of tapeworm.

SAMOA.[1]—Intestinal parasites: very common; ascaris, uncinaria, trichuris, oxyuris vermicularis. It is probable that every native child carries the ascaris, that every adult carries the hookworm and most of them the trichuris. A very few children have the oxyuris vermicularis. An examination of seventy men, picked for their good hygienic surroundings, all of them being members of the native guard who live in barracks, showed that all of them carried hookworm; that nearly all had, in addition, the whipworm and that a few had the ascaris. About five hundred examinations of the general adult population scattered throughout the island showed practically the same proportion. It was a matter for comment when the stool of a child failed to show eggs of ascaris. While large numbers thus carry one or more intestinal parasites, only a small percentage, say 10 per cent of the adult population, show marked effects from this cause, probably because of the abundance of food and small amount of hard work, conditions which make up for the loss occasioned by the parasites. However, practically every case of illness as a routine measure was treated for intestinal parasites in order to facilitate recovery to convalescence. Neglect of this measure would at times

delay the effect of treatment for other medical or surgical conditions.

KOREA.[9]—Ninety-nine per cent of Koreans have intestinal worms; chiefly ascaris. No systematic examination of stools.

GUAM.[2]—Ascaris, whipworms, and hookworms, both varieties, were found in almost 100 per cent of the natives. In 1910 the school children of Agat were brought to Agaña for examination and treatment. Of 121 children, 119 were positive to hookworms upon first examination and the whole number upon the second examination. The other worms were about the same. In this year all of the school children of the island were taken into the hospital between January 1 and July 1 for worm treatment, and observation gave practically the same results. Systematic stool examinations have been made and recorded for some years. All patients entering the hospital had stool examinations made as a matter of routine. Salines were given as a rule and the stool examinations were made a few minutes after a movement was obtained. There was no rule about the number of smears examined, but if one was negative the examination was generally carried to three or four slides before the case was considered negative. In the negative cases the examinations were made on two or more days. This work was very carefully done. Balantidium was found to be fairly common. This was worked up during the past year and the infection found to be more frequent than had been anticipated. One case of death was attributed to this cause as no other factor could be found at autopsy. No tape worms were encountered in the time under consideration.

"Tropical Liver" and Liver Abscess

RANGOON, BURMA.[10]—Liver abscess is of moderate frequency; until the last two years the usual treatment had

been to open freely and drain in the ordinary way; many quite early cases died as the result of secondary septic infection. In the early small abscesses the pus is sterile so far as the usual pyogenic organisms are concerned; amebas can generally be found if a proper selection of pus be made. In the older abscesses bacteria are generally present together with amebas; the bacteria found are coli, staphylococcus, and pneumococcus. Considering the relative proportions in the community of natives and Europeans, there is no doubt but that the large single tropical abscess of the liver is much more common among the latter. Ulceration of the appendix is found in a few cases of dysentery examined postmortem, but it does not give rise to symptoms during life. Intestinal hemorrhage is common to a slight degree in most cases of true dysentery; in a few cases of very acute bacillary dysentery hemorrhage has been very severe, and at postmortem the ulceration was insignificant. Profuse hemorrhage does not occur from the large gangrenous ulcers so common in amebic dysentery; the vessels are probably thrombosed long before they become ulcerated.

AGRA, INDIA.[3]—During 1909, 1910, and 1911, forty-three cases of liver abscess have been treated in the Agra hospitals. Twenty were operated on by the open method; i. e., incision, resection of rib if necessary, and drainage; of these, ten died; many come in with huge abscesses and in a very bad condition indeed, some almost *in extremis*. Thirteen cases were treated by aspiration and the injection of hydrochloride of quinine; of these, two died. The cases were all large single abscesses. We rarely see them before a bulging of the side or in front is visible, but the diagnosis is usually established by a leukocyte count. In all the cases the history of dysentery was invariably present. From our statistics liver abscess is much more common among natives: that

is because, for the most part, our Agra hospitals are for the admission of natives, but it is commoner among natives probably because of neglect of early treatment. No cases of appendicitis associated with dysentery and no cases of intestinal hemorrhage associated with liver abscess were seen.

COLOMBO, CEYLON.[7]—Liver abscess is not common although dysentery is very prevalent. It is more common among Europeans than among natives. Last year twelve cases were operated on with one death; of these only two cases occurred among natives. Where marked symptoms are present, indicating the location of the abscess, operation is a simple matter; the abscess is opened after excising a portion of the rib and shutting off the pleural cavity by stitches. Where no local tenderness or bulging existed, laparotomy was done and the liver palpated with the hand inside the abdomen. An abscess located by this method was opened by resection of a rib at a subsequent operation. In all cases drainage tubes were inserted and the cavity freely drained. In deep-seated abscesses where the opening had to be made through a considerable thickness of normal liver tissue, bleeding was found to be profuse, and had to be checked by gauze which was removed later and the tubes inserted. In ten cases the abscesses were solitary; in two cases multiple. Irregular fever, sweating and localized tenderness over the region of the liver, with increase of liver dullness are the chief signs.

WENCHOW, CHINA.[13]—Liver abscess fairly common. Six cases operated on, all recovered; swelling visible in each case. All had previously had dysentery.

SHOKA, FORMOSA.[8]—"Tropical liver" occurs in foreigners who live too well. Twelve abscess cases in Chinese. Where the exploring needle shows pus, incise; and if the liver is not adherent to the abdominal wall, stitch it to the peritoneum before opening. Recoveries

about 70 per cent. The abscess is generally solitary and the pus sterile; amebas not found. Cases generally do not come until there is a swelling. In many cases no antecedent history of dysentery.

GUAM.[2]—Liver abscess and tropical liver are not very common considering the number of cases of amebic dysentery seen.

KOREA.[9]—Liver abscess is fairly common; tropical liver, reported only by Weir.

SAMOA.[1]—Five cases of enormous chronic enlargement of the liver without splenic enlargement have been seen just before death. One of these cases was explored with needle in several directions without obtaining pus. No autopsies were possible. Liver abscess has not been found.

Cancer

RANGOON, BURMA.[10]—Carcinoma is considerably less frequent than in England. Breast, penis, and uterus are the parts most frequently affected. No precancerous stage observed. Epithelioma of the cheek is not uncommon and is probably excited by betel-chewing. Epithelioma of the penis is common among Chinamen. Carcinoma of the breast is not so common among natives as among women of European countries. Epithelioma of the tongue is exceedingly rare among natives; two cases seen during six years of hospital experience. On the other hand primary carcinoma of the liver appears to be very much more common among natives both Indian and Burman than among Europeans. This cancerous growth of the liver may be mistaken for liver abscess, as it gives rise to fever and pain. Carcinoma of the rectum is practically unknown.

AGRA, INDIA.[3]—Carcinoma is common in India and more cases are seen now than formerly because the village people resort to hospitals more frequently. Cancer occurs in all organs and parts of the body in about

the same proportion here as in Europe. Epithelioma of the penis and tongue is excessively prevalent.

PING YIN,[12] SOOCHOW,[5] AND WENCHOW,[13] CHINA.—Carcinoma fairly common; regions chiefly affected are breast, rectum, lips, cheek, uterus, penis, skin of back and esophagus. In many cases the cancer has been preceded by a small pimple, papule, or sebaceous cyst often of many years' duration.

JOHANNESBURG,[14] AFRICA.—Malignant disease does not appear to be so common among natives as among Europeans.

COLOMBO, CEYLON.[7]—In males carcinoma of the cheek, upper and lower jaws is common. Next in frequency is carcinoma of the penis, then carcinoma of the tongue. In females cancer of the uterus and cancer of the breast. A precancerous stage has often been noted in connection with cancer of the cheek in the form of leukoplakial patches.

SHOKA, FORMOSA.[8]—Carcinoma is common in the mamma, cervix uteri, upper jaw, penis, sometimes in old scars, and lip.

GUAM.[2]—Carcinoma of the uterus was seen in one woman, and it was not found at any of the postmortem examinations.

RANGOON, BURMA.[10]—Sarcoma not frequently met with, abdominal sarcoma springing from the pelvis has been most often observed. Sarcoma occurs in all regions of the body, but it is most common in the cervical region.

AGRA, INDIA.[3]—We see many cases of sarcoma, mainly of the long bones, jaws, nose, orbit and also of all parts of the body where such tumors usually occur.

SOOCHOW[5] AND WENCHOW,[13] CHINA.—Sarcoma is very frequent, involving upper jaw, long bones, eye, foot, testicle, parotid.

COLOMBO, CEYLON.[7]—Sarcoma is uncommon. It usually occurs in connection with the upper jaw.

SHOKA, FORMOSA.[8]—Sarcoma, fairly common, particularly so in the neck, also at lower end of the femur, and upper end of humerus.

KOREA.[9]—Cancer and sarcoma, fairly common, but not so prevalent as in the United States. The rarity of cancer of the lip in a race where pipe smoking is almost universal among men and not uncommon among women is rather noticeable. The frequency of breast cancer among women whose breasts are so exposed to the sun and various irritants is easy to understand. Ovarian cysts are quite common. Every one reports fibroids as common and in addition several have had cases of carcinoma of both the cervix and the body of the uterus. A number with experience elsewhere state it as their opinion that the frequency of this condition is about as in Europe and America.

SAMOA.—Sarcoma not observed.

GUAM.—No cases of sarcoma were seen.

Diseases of Women Among Natives: Ovarian and Uterine Tumors; Puerperal Injuries; Native Method of Accouchement

RANGOON, BURMA.[10]—Ovarian and uterine tumors are of moderate frequency. Genital and pelvic diseases of women are frequent, chiefly the result of venereal infection or sepsis following childbirth or abortion. Results of puerperal injuries are common in the district. Native methods of accouchement are primitive and barbarous.

AGRA, INDIA.[3]—In the special hospitals for women in Agra we see a large number of cases of ovarian tumors; twenty to thirty cases are operated on annually. They are usually very large tumors of the ovary or the broad ligament and frequently with many adhesions; the cases almost always do well. Uterine tumors are less common, but many cases of small and large fibroids are seen. Genital and pelvic diseases are very common among na-

tive women and there is a large out-patient and in-patient department here under three English qualified women physicians, as many of the cases are "purdah nashin" ladies. As regards the native method of accouchement, no cleanliness whatever is observed during and before labor; the woman is made to strain almost from the onset of the labor pains. The usual posture is the sitting one, and the placenta is in most cases extracted by the ignorant midwife directly after the birth of the child. Endeavors are now being made to educate these "Dhais" or native midwives in antiseptic and modern midwifery, and excellent work is being accomplished in attaining this end. Cesarean section is performed from ten to twelve times a year in the maternity hospital here, always for cases of contracted pelvis, usually due to osteomalacia or pronounced rickets.

HONGKONG.[11]—Ovarian and uterine tumors common.

PING YIN, CHINA.[12]—Uterine tumors are chiefly cancer of the cervix. Genital and pelvic diseases of women mainly syphilitic. Puerperal fever common and often fatal. Tetanus infection the result of puerperal injuries. Native method of accouchement, squatting position, labor rapid, often precipitate. First stage is very short and rather painless.

COLOMBO, CEYLON.[7]—Ovarian uterine tumors, extrauterine gestation, and pelvic cellulitis following puerperal injuries are very common. The native method of accouchement is purely expectant in type; no attempt is made to find out the presentation; no antiseptics are used but an oil, expressed from the seeds of the mayosa tree and said to possess antiseptic properties, which is freely applied over the abdomen and is also taken internally.

SHOKA, FORMOSA.[8]—Ovarian tumors, cysts, dermoids, and polypi fairly common. Displacements and prolapse of the uterus very common. Ovaritis and pelvic cellulitis,

puerperal or gonorrheal, and endometritis common. Puerperal injuries often lead to sloughing, cicatrization and stenosis of the vagina and to vesicovaginal and rectovaginal fistulas; fibroids of uterus not uncommon.

SAMOA.[1]—Chronic pelvic disease among the native women is practically unknown. Puerperal sepsis, however, is quite common; five cases presented for treatment in a year in which about two hundred births were recorded. Gonorrhea is almost unknown. The few cases which have been seen can nearly all be traced to cases that were imported about two years ago. When present, the disease is very mild in its course. The prevailing and common use of the drink called "kava" is said by some to lessen the liability to infection from this disease, but the infrequency of this disease is probably due to isolation from lines of travel, and the practical absence of a prostitute class.

KOREA.[9]—Genital and pelvic disease in women is common from displacements caused by unrepaired lacerations, short puerperium and general enteroptosis, of which dilated stomach is an important factor, due to constant nursing in infancy, irregular eating in childhood, and gluttonous eating in adult life. Complete prolapse not uncommon; native treatment is to burn off the presenting part with strong nitric acid, oil, or the actual cautery. The result is functionally good, but if pregnancy follows, then the case is serious. The treatment always is followed by cervical stenosis and often by vaginal stenosis. Endometritis, quite common, due to uncleanly hygienic habits, sexual indulgence and venereal insults. Salpingitis is surprisingly uncommon. Fistula, vesicovaginal and rectovaginal is not uncommon, and often is extensive. Lacerations, very common. Accouchement: Position, sitting, and on hands and knees. When labor is delayed, it is believed that kneeling on a bear's skin will cause the baby to come quickly. Foll-

well speaks of the custom of placing the beans and stalks of the castor oil plant at the foot of the patient. Apparently the danger of leaving an adherent or retained placenta in the uterus for several days is not sufficiently recognized. Accidents and malpresentations follow application of traction on the presenting part and the pushing and kneading of the abdomen. For difficult labor some natives use hot mud poultice, the mud taken from a rat hole and applied to the vagina, or a fresh split rooster applied to the vagina.

GUAM.[2]—Ovarian and uterine tumors are not frequent. Three cases of ovarian cyst were operated upon and two of fibroid tumor of the uterus. Many examinations of the pelvic organs were made and these were the only cases found. Three cases of pyosalpinx were operated upon. Lacerations from childbirth were common, but seemed to cause little trouble. Under the old system of midwives, puerperal infections were common. The method of accouchement was the same as our own, due, no doubt, to the instructions given by the physicians who began obstetric work among the natives in 1900. The women have a habit of tying a band or cord around the waist above the uterus for some time before labor for the purpose of keeping down the pain. This was the only peculiarity seen.

Genitourinary Diseases Among Men

RANGOON, BURMA.[10]—Venereal affections of the bladder, penis, and testicles are very common. Hypertrophy of prostate is rare, but has been seen. The number of men living over the age of sixty years is small in Rangoon.

AGRA, INDIA.[3]—Genitourinary diseases among men are common in India and about 7 per cent of our admissions are for stricture, perineal abscess, extravasation of urine, cystitis, etc. Enlargement of the prostate seems from

what we see here to be common among old men. We never see the cases until they come for cystitis and retention of urine and are usually in a very bad condition. If prostatectomy is performed in such cases as these, they hardly ever recover. We have performed quite a number of prostatectomies, but in more favorable cases and about 50 per cent have recovered and done well.

HONGKONG[11] AND WENCHOW,[13] CHINA.—Genitourinary diseases and their complications are common in men. Enlarged prostate is not common chiefly by reason of the fact that Europeans rarely stay out long enough in the East and this complaint has not been found among Chinese.

COLOMBO, CEYLON.[7]—Gonorrhea is fairly common; a large proportion of these cases suffer later on from stricture. Hypertrophy of prostate has been observed in a large number of cases, but only a few submit to operative treatment.

SHOKA, FORMOSA.[8]—Genitourinary diseases are exceedingly common; e. g., chancres, buboes, gonorrhea, venereal condylomata and warts, stricture of the urethra, orchitis, spermatorrhea and impotence. Have not seen hypertrophy of the prostate in old men.

GUAM.[2]—No cases of genitourinary disease were found on the island. Gonorrhea is not very common among the men as they marry quite young. It is becoming more frequent, however, as there are more men being enlisted on the station ship which goes to Japan or China about twice a year. Primary syphilis and chancroid were not seen at all and no primary syphilis exists on the island. I believe that there is a certain immunity to the disease owing to the hereditary syphilis (gangosa) now on the island. Only two cases of hypertrophy of the prostate were seen. One of these was in as pure-blooded a Chamorro as there was on the island.

SAMOA.[1]—Hypertrophy of the prostate was observed

in an American negro resident here, but no case has been found in the native though its clinical symptoms often have been sought. Rectal digital examinations have not been made in a series of cases.

KOREA.[9]—Genitourinary diseases are not materially different from other countries; bubo, not very common; stricture, common; urethritis, nonspecific, in which no gonococci are found. Senile prostate rare. No one seems to have made any special search for the condition and cases to which attention was called by symptoms were rare indeed. Hypertrophy from gonorrheal infections is common enough.

Appendicitis: Rule for and Method of Operating; Treatment of General Peritonitis

RANGOON, BURMA.[10]—Appendicitis occurs frequently. Operation in acute stage is performed at the earliest opportunity. Results are excellent. For general peritonitis following perforation, the Fowler-Murphy treatment with free abdominal drainage is carried out. The results have been very gratifying.

AGRA, INDIA.[3]—Appendicitis is not common among natives of India. The cases we see are almost always in the European hospital, we always operate at favorable periods of quiescence and the results are very satisfactory indeed.

SOOCHOW, CHINA.[5]—I presume that I have seen as many as ten cases, but they refuse operation. I consider it much more rare than in the United States.

PING YIN, CHINA.[12]—Appendicitis unknown.

WENCHOW, CHINA.[13]—Appendicitis very rare. Have only seen one or two cases in Chinese which I have diagnosed as appendicitis. Chronic abdominal abscesses generally discharge worms, making the diagnosis of the original trouble difficult.

SHOKA, FORMOSA.[8]—Generally see appendicitis at the

abscess stage, when the treatment consists of making a hole and putting in a drainage tube. These cases do well.

SAMOA.[1]—Appendicitis is quite rare. Only one case has been found in 1000 surgical conditions operated upon.

Gastric Symptoms Caused by Gallstones, Ulcer, Appendicitis and Cancer

RANGOON, BURMA.[10]—Several cases of gastric symptoms due to gallstones have been met with. Gastric and duodenal ulcers are on the whole rare, but occur from time to time. Cancer of stomach is not of frequent occurrence. Gastric symptoms due to appendicitis have only rarely been noted.

AGRA, INDIA.[3]—Gallstone disease, gastric, and duodenal ulcer and appendicitis are not common among the natives in this part. They are rarely seen in our hospitals except a few cases in women.

HONGKONG.[11]—Gallstones and biliary sand are very common. Duodenal ulcer is not uncommon; appendicitis is very common; cancer of the bowel not common.

SHOKA, FORMOSA.[8]—Gastric symptoms common, due to too much food. Operated on a few cases of gallstones and several cases of pyloric stenosis due to cicatrization. Appendicitis is generally seen at the abscess stage.

GUAM.[2]—Appendicitis from ordinary causes is very rare. There were only four cases in the native population during two years stay in Guam. All persons dying in Agaña and immediate vicinity in which the cause of death had not been accurately determined were subjects of postmortem examination. No cases were found. The population of the area was about 8000. The cases of appendicitis that occurred were all seen rather late with one exception and all recovered after operation; the course of the disease being about as it would in our own people. No cases of gallstones. There were no cases of gastric or duodenal ulcer.

SAMOA.[1]—Gastric symptoms due to indiscretion in diet are not unknown, but are rare.

KOREA.[9]—Gastric symptoms are very common; many times they are hard to distinguish from general intestinal symptoms, and those from actual disease are often lost sight of or at least confused with those resulting from adhesions after "needling." This makes the diagnosis of reflex gastric symptoms doubly hard. Cancer has been definitely located in a number of cases. Gallstones have been suspected in a few cases, but their existence has not been proved: several undoubted gallstone cases have been observed in fat women in most of whom jaundice was present. Catarrhal jaundice without pain or other evidence of complication is quite common. Dilated stomach and associated gastritis are prolific causes of distress and lead to the oft-repeated statement that the "food doesn't go down well."

Dr. H. C. Clark (1914) critically examinmed several hundred native laborers of the Canal Zone in regard to reflex gastric disturbance and concluded that reflex gastric symptoms due to causes from the gastro-duodeno-hepatico-pancreatic system awere not uncommon.

Leprosy: Leper Colonies and Segregation; Surgery for Leprosy

RANGOON, BURMA.[10]—Leprosy is common and Major Rost, I.M.S., has reported successful cases of injection by his vaccine. The cases are segregated in asylums under medical supervision. No leper colonies.

AGRA, INDIA.[3]—Leprosy is uncommon in this part of India. All the cases are so far as possible segregated into leper asylums. The asylum is visited by health officers periodically.

SOOCHOW,[5] PING YIN[12] AND WENCHOW,[13] CHINA.—Leprosy of the anesthetic type is in this region though not

abundant. The "lion face" is common. There is no segregation. The people have slight fear of it.

JOHANNESBURG, AFRICA.[14]—Leprosy very common among many South African tribes.

SHOKA, FORMOSA.[8]—Leprosy fairly common. Have tried nastin in vain. Not segregated.

GUAM.[2]—There are twenty-five cases on the island. Salvarsan was being tried in the treatment of the disease, but no improvement was noted in any patient. Segregation has been practiced since 1902 and there was some attempt at segregation by the Spaniards. The disease does not seem to be increasing and the type does not seem to be very virulent.

SAMOA.[1]—Leprosy has not been observed in American Samoa; however, a small colony of lepers is present in German Samoa.

KOREA.[9]—Leprosy is found only in the southern half of Korea. In Seoul the average is one case a month and they all came from farther south. Not segregated. There exists only one asylum for their care.

Yaws

GUAM.[2]—Fairly common, but did not seem so much so as it was at first and the disease is certainly not so frequent as it is in Samoa. The lesions are not so numerous or "wet" as they are there. Salvarsan had not been tried.

SAMOA.[1]—Every Samoan child contracts yaws, as a rule about the age of three to five years. The mother is willing to expose her child to the infection because she believes it is better for the child to have it in early life. Before the use of "606" the open lesions persisted from six months to a year or more in spite of treatment with potassium iodide. Since the use of "606" the open lesions are healed in a week or ten days. Too few cases have been treated in this manner, to date, to give even

an index as to the permanency of this method of treatment.

KOREA.[9]—Yaws not observed.

Tropical Ulcers and Granulomas of Skin

RANGOON, BURMA.[10]—Tropical ulcers of the phagedenic type have been successfully treated by peroxide of hydrogen.

JOHANNESBURG, AFRICA.[14]—Ulcers of various kinds prevalent on the legs, especially among mine boys working under ground.

WENCHOW, CHINA.[13]—Tropical ulcers and granulomas of skin common.

KOREA.[9]—Tropical ulcers not found.

SAMOA.[1]—A common form of ulcer as a rule affects the legs, varies in size from the area of the palm of the hand to an ulcer involving one-fourth of the surface of the lower leg; commonly seen on the calf instead of on the anterior tibial region. Other sites are the outer lateral-tibial and flexor aspects of forearm, generally more than one and seldom more than four. These ulcers discharge a stinking, watery fluid, small in amount, and have a yellowish granulomatous base flush with the epidermis which can be easily curetted to a depth of one-fourth of an inch, when an oozing, bright red, clear base can be obtained with a sharply limited ragged skin edge. Curettage followed by large doses of potassium iodide and combined with surgical cleanliness have resulted in a healing ulcer in most cases. When healed a thin, broad, parchment-like epidermal scar is left, not unlike the scar of syphilitic ulceration. It is believed that these ulcers are a late manifestation of the "yaws" though the belief has not been backed up, as yet, by any specific tests such as the Noguchi or Wassermann. Of late salvarsan has been used in a few cases in addition to the other

treatment with the result that healing has apparently been more rapid.

GUAM.[2]—"Tropical ulcers" have all disappeared with the use of mercury and iodide of potash, as applied to gangosa (syphilis).

Filariasis

RANGOON, BURMA.[10]—No experience. Infections are not common in Burma.

FILARIA IN THE PHILIPPINES.—Captain Phalen and Lieutenant Nichols of the United States Army in 1908 and 1909 made about 7,400 blood examinations in various localities to get an idea of its prevalence and distribution and found the disease to represent 2 per cent of infections for the islands; 35 cases had elephantoid disease. Protection from mosquitoes is preventive but this is impracticable for a native population, hence, whenever a case is discovered, among the native employees, it should be discharged at once as the Culex fatigans Wied., which transmits the disease is omnipresent.

SOOCHOW,[5] HONGKONG,[11] CHINA.—Filaria nocturna has been found in a few cases, two of elephantiasis and one in a severe case of chyluria. Four other cases of elephantiasis have been examined and the filaria not found.

JOHANNESBURG, AFRICA.[14]—Filaria nocturna present in some areas.

SHOKA, FORMOSA.[8]—Have seen a few cases of filaria nocturna. Generally associated with orchitis.

SAMOA.[1]—Filariasis. Salvarsan tried in ten cases without benefit. Complications: localized elephantoid swellings treated successfully by surgical removal; diffuse elephantoid swellings not treated with success surgically.

KOREA.[9]—Filariasis not found.

GUAM[2]—Thirteen cases have been found. No symptoms, no treatment, no hematochyluria.

Ainhum and Goundou

MANILA.[15]—The board has seen one case of ainhum in the person of a Jamaica negro; not seen in BURMA[10] or FORMOSA[8] but in JOHANNESBURG,[14] AFRICA,[6] the disease is fairly common. Goundou not diagnosed.

SAMOA, KOREA, AND GUAM.—Ainhum and Goundou not seen.

Tumors: Benign and Malignant

SAMOA.[1]—Tumors, fibromas, and lipomas most often seen; malignant tumors rare.

KOREA.[9]—Keloid of moderate degree quite common; lipomas, frequently seen; osteomas, few; angioma and uterine fibroids few cases; papilloma, common.

GUAM.[2]—Lipomas and a few sebaceous cysts only were seen. Any part of the body seemed likely to be the site.

Urinary Calculi

RANGOON, BURMA.[10]—Urinary calculi are very much less frequent than in India. Litholapaxy is the selected operation for stone in the bladder. Results only moderately good, chiefly owing to want of experience.

AGRA, INDIA.[3]—Calculi in the bladder are common in India, especially in children, and are mostly composed of either uric acid or oxalates. The chief operation is litholapaxy in about 90 per cent of the cases. The results are very successful, hardly any cases are lost. If litholapaxy can not be performed because the stone is too large or the urethra too small for the passage of instruments, then suprapubic cystotomy is performed; and the bladder drained.

HONGKONG,[11] SOOCHOW,[5] CHINA, AND FORMOSA.—Gravel more common than stone in Europeans; bladder stone common in Chinese; kidney stone not diagnosed.

SAMOA.[1]—Urinary calculi of bladder and kidney not observed clinically. Autopsies difficult to obtain.

KOREA.[9]—Urinary calculi of bladder and kidney; all reports indicate that these conditions are rare. Whether there is any connection with the water supply or not, it might be noted that the geology of Korea is essentially granite and that limestone and marble occur but in very limited quantities.

GUAM.[2]—Urinary or renal calculi not seen.

Hodgkin's Disease

RANGOON, BURMA,[10] AGRA, INDIA,[3] SOOCHOW, CHINA.[5]—Hodgkin's disease very rare, only one case has been definitely diagnosed; the patient was a European; a few cases in Hongkong, and in Ping Yin,[12] China; in Africa[14] prevalent among natives.

SAMOA.[1]—Hodgkin's disease not seen, though enlargements of glands are common from other causes.

KOREA.[9]—Hodgkin's disease not seen.

GUAM.[2]—No cases seen.

Diabetes

RANGOON, BURMA.[10]—Diabetes common among natives of India. Rare among Burmans. Treatment is difficult because natives of India will not diet themselves. Gangrene is not very prevalent.

AGRA, INDIA.[3]—Diabetes is very common in India, especially among the better classes. It occurs chiefly among the native Hindus. Gangrene is rare among diabetics, but carbuncle is very common in these cases and is frequently seen in the hospitals.

HONGKONG.[11]—Glycosuria common in Chinese; true diabetes not so common; treatment, high frequency autocondensation will cure glycosuria, but not true diabetes. It is infrequent in FORMOSA[8] and WENCHOW,[13] and in AFRICA[14] diabetes is not found. SAMOA.[1]—Diabetes seen

only in one instance and in a European. KOREA.[9]—Diabetes rare. GUAM.[2]—Not seen.

Paralysis Agitans

AGRA, INDIA,[3] BURMA[10] AND AFRICA.[14]—Paralysis agitans is rare among the natives.

SAMOA, GUAM, KOREA.—No cases observed.

Infantile Paralysis

WENCHOW, PING YIN, AND FORMOSA.—Infantile paralysis is common.

KOREA.[9]—Infantile paralysis cases seen long after acute symptoms had passed.

SAMOA.[1]—Not observed, neither acute nor terminal effects.

GUAM.[2]—No new cases. There had evidently been an epidemic some eight years ago as several young people had the resulting paralysis; these cases were found to have had the disease about the same time.

Hernia

RANGOON, BURMA,[10] AGRA, INDIA.[3]—Hernia is of moderate frequency among the working classes. The cause is probably due to muscular exertion. It is not so common as among Europeans and one reason may be the position a native assumes in the act of defecation; i. e., sitting on his feet with the inguinal rings well protected by the thighs; nor do natives work as hard as Europeans. Is much more frequent among the hard working Chinese in CHINA, also in FORMOSA and in AFRICA.[14]

SAMOA.[1]—Hernia is rarely seen, probably because they do not present with it; two cases of strangulated variety seen in five hundred operations, one inguinal, one femoral.

GUAM.[2]—Hernia is quite frequent in men, and strangu-

lation was common. There were no cases seen in the female. All cases were oblique inguinal and aside from congenital defects, the only cause seemed to be the general anemic condition resulting from hookworms and the heavy labor incident to obtaining saw logs.

KOREA.[9]—Hernia is stated by every one to be quite common in children and adults; most cases are operated, few trusses being used.

Tropical Abscess

SAMOA.[1]—Abscess is the most frequent surgical condition met with. These abscesses are deep-seated, as rule, close to or surrounding a large artery, very little induration, very similar to the abscesses seen in low grade septicemias; generally single; common sites; brachial artery just above elbow, femoral artery Scarpa's triangle, iliac artery pointing at anterior superior spine of the ilium; little or no constitutional reaction; common organism a staphylococcus of low virulence; rapid recovery by drainage through small opening.

KOREA[9] AND GUAM.[2]—Tropical abscesses not seen.

Congenital Defects

RANGOON, BURMA.[10]—Congenital defects are on the whole somewhat rare, except imperforate anus which is not uncommon.

AGRA, INDIA,[3] AND FORMOSA.[8]—All the congenital defects are fairly common except squint. In INDIA accessory fingers are very commonly seen, but natives will never have the accessory finger amputated as it is considered a sign of bad luck.

GUAM.[2]—The natives of Guam seem remarkably free from congenital defects; very few cases of talipes, squint, harelip, and but one of cleft palate and clubbed feet and hands.

SAMOA.[1]—Harelip, cleft palate, club-foot, one of each

case has been seen in last six thousand cases treated; squint seems to be rare.

KOREA.[9]—Squint not uncommon; treatment was not desired. Harelip, quite common and it is the experience of everyone that once you begin to treat these cases your "fame" immediately spreads and patients come until the condition seems more common than it really is. All stages of the deformity are found to exist from a mere notch to a generally "open countenance." Cleft palate, clubbed feet and hands, polydactylism, imperforate anus, hermaphroditism, undescended testicle, imperforate vagina, exstrophy of the bladder, hypospadias, atresia of the vagina and absence of uterus, one case each.

Varicose Veins

RANGOON, BURMA;[10] AGRA, INDIA;[3] PHILIPPINES.—Varicose veins seldom require operation. Hydrocele extremely common among natives of India, not so common among Burmans who do not wear tight fitting "loin" cloth; varicose veins are common among the coolie class in China.

SAMOA.[1]—Varicose veins observed in natives but once.

KOREA.[9]—Rather uncommon.

GUAM.[2]—No cases of sufficient magnitude to attract attention were seen.

Hemorrhoids and Fistula

INDIA,[3] BURMA,[10] CHINA AND FORMOSA.—Hemorrhoids and fistula are of moderate frequency. More frequent among those following a sedentary occupation.

SAMOA.—Hemorrhoids and fistula not seen.

KOREA.[9]—Hemorrhoids: Everyone states that the condition in a mild form is quite common and that severe cases are not often seen. The continued sitting posture is a reason advanced for the presence of the affection since constipation is so uncommon. It is worthy of note

that although this affection of the rectal blood vessels is less common than in America, that of infection, as represented by abscess formation and fistula, is much more prevalent. Fistula: All agree upon the frequency of this affection in mild and aggravated forms. Patients in Kangkai have repeatedly told the writer that pinworms cause these fistulas and that their exit has been frequently seen. The treatment by repeated needling and lancing of the anus in certain cases of chronic gastroenteritis of children and young adults and in other abdominal conditions, with as yet undifferentiated symptomatology, on the assumption that they were suffering from "rectal disease," probably is a cause. The lack of any or sufficient cleansing after defecation in a large proportion of the population must be an important predisposing cause. The warm floor is also believed to have a causal influence. Treatment: Cut and scrape, some use bismuth paste. Two hundred cases were treated with excellent results in nearly all except tuberculous patients.

GUAM.[2]—Hemorrhoids were not common, a few ccases only and only one case necessitating a Whitehead operation. Fistula rare.

Actinomycosis, Glanders, Echinococcus

BURMA.[10]—No actinomycosis as an indigenous disease; a few cases of "Madura foot" are seen, but they were always imported from India. Glanders is exceedingly common among the ponies of the public conveyances in Rangoon. Cases of acute glanders in man were met with three times last year, but they are probably commoner than is supposed, for in the house from which one of last year's cases came, three people died of "abscesses" during two years. Bacteriologic examinations are not carried out save among the comparatively few patients who come to the hospital. There is a disease which resembles glanders very closely and which is fairly com-

mon among the natives of Rangoon. So far as we are aware this disease has not been hitherto described; a full description of this disease will be published as soon as our bacteriologic work has been confirmed. Echinococcus infection has been reported among the natives of Burma, but every case examined in the laboratory or in the mortuary has proved to be a mistaken diagnosis.

AGRA, INDIA;[3] FORMOSA; SOUTH AND WEST AFRICA.—No cases of these diseases.

SAMOA.[1]—Actinomycosis, glanders, and echinococcus not seen.

KOREA.[9]—Weir reports one bone case of actinomycosis. No cases of glanders reported. Dr. Oh, of Kunsan, Korea, in a personal communication stated that he had had one liver case of echinococcus. Several cases of anthrax reported.

Tonsils and Adenoids in Children

BURMA,[10] INDIA,[3] SOUTH AND WEST AFRICA.[6]—Tonsils and adenoids are not so common among native children as among Europeans. Native children live an open air and free life. Nasopharyngeal diseases are very frequent in HONGKONG[11] and other crowded Chinese cities. Nearly every child one examines has a hypertrophied Luschka's tonsil; posterior rhinoscopy shows hypertrophic swelling of the orifices of the eustachian tubes and some swelling of the posterior ends of the inferior turbinate bones. All Chinese patients have some postnasal catarrh accompanied by an excessive secretion of mucus, due to their extremely crowded and unhygienic mode of life; also their excessive ingestion of farinaceous food leads to an increased production of mucus not only in the alimentary canal, but from all the mucous tracts.

SAMOA.[1]—Adenoids in pure-blooded natives sought and not found. Adenoids common in young half-castes, white and Samoan.

KOREA.[9]—Adenoids in children. This subject seems not to have attracted the attention of the various physicians to any great extent. Mouth-breathing as an affection of sufficient importance to modify the facial expression is at least not common; doubtless many of the prevalent "running ears" and sore throats would disappear if one could remove the adenoids.

GUAM[3]—Adenoids and mouth-breathers, very rare.

Infectious Diseases of Children

BURMA.[10]—Diphtheria and scarlatina very infrequent. Mumps common among natives of India from the hill districts and less common among natives of Burma from the hills. Among the natives of Burma who live in the plains, noma is very rare.

MANILA.[15]—Diphtheria a few years ago was considered very rare in the Philippines. Whether unrecognized before or more recently introduced, it is now found not infrequently. In one case virulent bacilli were present in the throat ninety days after the onset of the disease and disappeared promptly on spraying the throat with a culture of staphylococcus pyogenes aureus. In another case in which were found virulent bacilli, after twenty-one days similar prompt disappearance occurred after using the staphylococci.

AGRA, INDIA.[3]—Diphtheria is not common, but it is seen occasionally among native children; never in an epidemic form. Scarlatina never seen among European children in schools. Measles is very common both among European and native children. Noma never seen in this part of India.

HONGKONG[11] AND CHINESE CITIES[5, 12], FORMOSA,[8] AND IN SOUTH[14] AND WEST[6] AFRICA.—Scarlatina is practically unknown. Cases that have been reported have been of doubtful diagnosis or have been imported. Diphtheria is not common; pseudodiphtheria more so and a mem-

branous affection of the throat due to streptococcus pyogenes still more common. Postdiphtheritic paralysis is not a common sequence. Mumps is very common, especially among the Chinese. Mucus disease is an excessively common complaint among the European children born or resident in the East, due in the main, to native servants acting without maternal supervision and overfeeding the children of about seven years of age; certainly it is more frequent in children of this age than in younger children. This disease is very amenable to treatment, a rectified diet and small doses of arsenic and occasionally minute doses of opium to control the lienteric diarrhea which is very prone to result therefrom.

SAMOA.[1]—Diseases of children occur only when introduced from other islands. Chicken-pox has been endemic for some years. An epidemic of measles occurred during the past year attacking practically every person under the age of nineteen, killing about 8 per cent. Dysentery occurring during convalescence was the cause of death.

KOREA.[9]—Diphtheria is not often seen by the foreigners. It is increasing in frequency. Perhaps this is apparent only because of a more widespread use of the dispensary by the common people for the treatment of minor affections. It is possible that the concentrated tobacco smoke of the Korean house operating continuously day and night may decrease the frequency of infection; the degree of contagiousness is very evidently much below that found in America. Scarlatina reported as having been seen by only three men and they say it is rare. Hirst believes it is increasing in frequency somewhat. Parotitis is uncommon in some regions, common in others. Every doctor, except one, reports cases of noma and most speak of it as being fairly common. All these cases were fatal except one, and all were seen several days after the onset. Most of the cases were seen during epidemics of measles. One case of diphtheria was

reported in which antitoxin was used. Mumps: epidemic in 1910; 53 cases. Measles epidemic in 1909. Whooping cough epidemic, 59 cases. Ophthalmia is common. Many cases of syphilis seen.

GUAM.[2]—No diphtheria, scarlet fever, mumps, smallpox or noma. Had about fifty cases of chicken-pox and a good many cases of yaws; epidemic conjunctivitis was common in the late part of 1909 and early part of 1910. There also is a conjunctivitis more common in children and young adults though by no means uncommon in adults, which resembles trachoma but which yielded quite readily to ½ per cent zinc sulphate solution. There is a disease known locally as "guha" and which has been described under the name of "epidemic asthma," which is more prevalent during the periods of greatest rainfall, July to October. It is quite fatal in young children and occurs occasionally in adults. There is a fever of moderate severity, no glandular involvement, and the postmortem picture resembles a capillary bronchitis. Guha has not been seen in a foreigner.

Ludwig's Angina

BURMA.[10]—Ludwig's angina not frequent.

INDIA,[3] FORMOSA,[8] WEST[6] AND SOUTH[14] AFRICA.—Ludwig's angina is never seen.

SAMOA.[1]—Not observed. KOREA.[9]—Rare.

Elephantiasis

BURMA.[10]—Elephantiasis of moderate frequency. Much less so than in Southern India. The vast majority of cases are imported from INDIA.

AGRA, INDIA.[3]—Elephantiasis is not found in these parts, we occasionally see a case that has come from Lower Bengal or the South of India where it is common.

PING YIN, CHINA.[12]—Elephantiasis rare; in WENCHOW, CHINA,[13] is common; none in FORMOSA,[8] but in SOUTH

AFRICA,[14] elephantiasis very common; in some parts of the East Coast, also in some localities in WEST AFRICA.[6]

GUAM.—There was but one case of elephantiasis on the island.

SAMOA.[1]—Perhaps one in every hundred adults has some form of elephantiasis: legs most common; scrotum next, penis next, breast next, arms next. Experience here seems to point to the truth of the surgical principle, that a localized elephantoid swelling which is completely removed by surgery is not liable to return, but a diffuse elephantoid swelling attacked and partly removed surgically, will probably be aggravated by the surgical interference and in a year or two become of greater size that it would have become if no operation had been performed. The native believes that the scar left by an infected wound in elephantoid tissue will check the growth of the swellings and he practices this method of treatment with some show of success.

KOREA[9] AND PHILIPPINES.[15]—Not frequent.

Skin Diseases

BURMA.[10]—Yaws common in the Chindwin District of Upper Burma; rare elsewhere. Skin diseases have not been investigated with any thoroughness at this hospital.

MANILA.[15]—A member of the United States Army Board has conducted a clinic on skin disease for several years in the Philippine General Hospital. The 532 cases that have been observed and treated during that time are tabulated as follows:

Dermatomycoses.—Blastomycosis, 11, 2.07%; tinea circinata, 171, 32.14%; tinea versicolor, 14, 2.63%; tinea nigra, 2, 2.63%; tinea sycosis, 2, .38%; tinea tonsurans, 1, .19%; tinea favus, 4, .75%; tinea imbricata, 4, .75%; undetermined, 11, 2.97%.

Infections, Probably Bacterial.—Impetigo simplex, 20, 3.76%; acne vulgaris, 14, 2.63%; impetigo contagiosa, 10,

1.88%; dermatitis, 46, 8.65%; dermatitis, vesicular, 3, .56%; dermatitis papular, 8, 1.5%; cellulitis, 1, .19%; infected wound, 1, .19%; furunculosis, 3, .56%; folliculitis, pustular, 4, .75%; leprosy, 1, .19%.

Diseases Due to Protozoa and Animal Parasites.—Ground itch, 1, .19%; syphilis, secondary, 10, 1.88%; syphilis, tertiary, 1, .19%; mites, unclassified, 3, .56%; scabies, 25, 4.7%; yaws, 11, 2.07%.

General Skin Diseases.—Pemphigus, 4, .75%; pompholyx, 11, 2.07%; psoriasis, 6, 1.13%; herpes, 5, .94%; herpes zoster, 7, 1.32%; lichen, 1, .19%; seborrhea, 3, .56%; dermatitis venenata, 2, .38%; gangrene, moist, 11, .19%; eczema exfoliatum, 1, 3.2%; eczema sclerosum, 24, 4.51%; eczema erythematosum, 3, .56%; eczema papulosum, 3, .56%; urticaria, 1, .19%; vitiligo, 1, .19%; prurigo, 3, .56%; blisters, 1, .19%; alopecia areata, 1, .19%; hyperkeratosis, 10, 1.88%; undetermined, 46, 8.65%; grand total, 532 cases.

Blastomycosis of the skin has been studied extensively by the Board. (See the *Philippine Journal of Science*, iii, No. 5, p. 395, Section B, November, 1908.) Blastomycosis of the lungs has also been found. In CHINA AND FORMOSA[8] skin diseases of every variety exist.

SAMOA.[1]—The common skin diseases are: chromophytosis, trichophytosis, a pustular disease of extremities, a scabies-like disease.

KOREA.[9]—Psoriasis, fairly common, except in the north, where a dozen a year out of two thousand skin cases were seen. Scabies, very prevalent. Lacquer dermatitis and poisoning, occasional, sometimes fatal, especially among hat makers and occasionally the wearers. Ichthyosis, fairly common. Eczema and dermatitis, universal. Acne vulgaris, not very common, chiefly among better classes. Acne rubra, rare. Acne indurata, few cases. Alopecia, rare. Dermatitis calorica, common. Dermatitis exfoliativa or pityriasis rubra, two cases,

both died. Dermatitis medicamentosa, two cases due to iodoform; one in Japanese. Dermatitis venenata, occasionally. Erysipelas, few cases each year. Herpes, rare. Hyperidrosis, few cases. Leucoderma, common, nevus, few cases. Pediculosis, common. Urticaria, few cases.

GUAM.[2]—Skin diseases are not common in Guam; "ground itch" is frequently seen, and tinea circinata is fairly common. Ichthyosis was more common than in any other tropical country in which I have had duty.

Trichophyton Skin Infections—"Prickly Heat"

AGRA,[3] RANGOON[10] AND FORMOSA,[8] INDIA.—Very common indeed among all natives of the lower classes. Treatment consists of mercurial and chrysophanic ointments, iodine, and x-rays. Prickly heat, although often extensive and troublesome in hot weather and rainy season, is not a disability. It is treated with lotio hydrarg. perchlor. (1 :1000) and drying powders of boric acid, oxide of zinc, and starch.

KOREA.[9]—Trichophyton skin infections are found, ringworms of the general surface, genitocrural region and of the scalp are seen occasionally. Treatment consists in plenty of green soap and water washings, iodine, and sulphur ointment.

SAMOA.[1]—Trichophyton infections are very common. It is difficult to find a native without one of its forms. Treatment used is tincture of iodine locally with excellent results. Only one case of tinea circinata has been seen, and that in a man who belonged to an island (Tokelau) where the disease is endemic. Prickly heat is far more severe than the type seen in more temperate regions. No satisfactory treatment has been evolved. Sea bathing seems to aggravate the condition in Samoa rather than relieve it, probably because of the numerous

forms of phosphorescent animalcules in the sea water. Treatment most satisfactory from a palliative standpoint is a wash of aluminum acetate with one per cent carbolic acid.

GUAM.[2]—Tinea circinata is fairly common, though not so much so as it was in the Philippines in 1900-1902; treatment, 15 per cent salicylic acid in alcohol. Heat rashes were rare and caused no disability.

Furunculosis

AGRA,[3] RANGOON,[10] INDIA.—Furunculosis is seen in the hot weather and rainy season, and it is fairly common especially among Europeans. Our procedure is to take a culture from an unopened boil, prepare a vaccine, and give regular doses. The cases always do well under vaccine treatment; staphylococcus albus is generally found.

HONGKONG,[11] PING YIN[12] AND FORMOSA,[8] CHINA.—Furunculosis very common in the hot months, best treated with autogenous vaccines; no failures yet from this method of treatment; tincture iodine applied in out cases.

SAMOA.[1]—Furunculosis is rarely seen in the native; is frequently seen in the white race, about the same as in temperate climate. Best treatment, autogenous vaccination.

KOREA.[9]—Furunculosis is seen everywhere. The custom of pasting little pieces of oiled paper over any sore prevents the healing and creates a tendency to spread. Cases are treated by cleansing incision where necessary, and a 70 per cent alcohol dressing has proved effective.

GUAM.[2]—Furunculosis is common among Americans. Treatment: incision, carbolic acid, alcohol applications, and the use of Bier's cups. A few cases necessitated the use of vaccines and the results were good. The condition did not seem at all common among the natives.

Pemphigus Contagiosum

MANILA.[15]—The treatment of pemphigus contagiosum has been very simple. We have had very good success using equal parts of pure camphor and carbolic acid. The skin of the bleb is torn away and the denuded area well swabbed with this mixture. If all vesicles are so treated before they rupture and spread the infection, the disease may be cured in a few days. Tincture of iodine is also very efficient used in this way.

HONGKONG.[11]—Pemphigus contagiosum very common; treatment by biniodide of mercury 1:2,000 and a dusting powder of equal parts of talc, boric, and salicylic acids.

SAMOA.[1]—Pemphigus contagiosum not present.

KOREA.[9]—One case in a girl. Treatment; wash of lime-water and dusting powder of boric acid and starch.

GUAM.[2]—A few cases among children. Treatment: cleanliness and Fowler's solution.

Lesions of Lower Extremities in Barefoot Natives

RANGOON, BURMA.[10]—A curious melanotic sarcoma of the heel has been seen upon one or two occasions.

AGRA, INDIA.[3]—Few cases of any trouble of the feet in natives. Occasionally they get fissures from the hard skin. Cancer of the skin of the feet among natives has not been observed.

HONGKONG.[11]—A pemphigoid eczema occurs on the skin of the feet which is of an exceedingly contagious nature. It is characterized by, at the first, intense itching, generally between the toes, then on the soles of the feet; later, a vesicle forms, the contents of which spread the affection to other parts of the body, the final condition being a purulent one. No organism discovered.

FORMOSA,[8] PING YIN,[12] AND WENCHOW,[13] CHINA.—Carcinoma has been observed on the sole of the foot following cut, plus infection and Chinese treatment by irritating plasters.

KOREA.[9]—Lesions of skin of lower extremities not found.

GUAM.[2]—Skin troubles of the lower extremities confined largely to the "ground itch" probably caused by the hookworm.

SAMOA.[1]—Lesions of skin of lower extremities in barefoot natives exceedingly common. There are three types: First, in young children, multiple small punched-out sores called "poi," look not unlike pustular eczema; begin as a successive crop of pustules beneath a superficial layer of epidermis, commonly on soles of feet, palms of hands, legs up to knees, rarely on arms and body, and are chronic; weeks to recover; little or no constitutional reaction; recovery under cleanliness and application of mild parasiticides such as balsam of Peru; commonly found to be a precursor of yaws, though in all probability an independent condition. Second type: in adults as a rule; scabies-like involvement of skin mainly on the legs and bodies; no parasite demonstrated; seems to affect whole families; slow chronic course aggravated by salt-water bathing; thickening of epidermis, dry, scaly itching lesions believed to be due to a parasite living in the sleeping-mats. Third type: large ulcers in adults.

GANGOSA

CHINA,[7] KOREA,[9] FORMOSA,[8] BURMA,[10] SAMOA,[1] AND AUSTRALIA.[6]—Gangosa was not observed.

GUAM.[2] We are satisfied that the disease is inherited syphilis transmitted for several generations, the exact date of its introduction into the island being unknown. Clinically the lesions are those of syphilis. Wassermann positive in about 85 per cent of the cases tested, and also present in practically all of the cases in which the blood relatives (brothers and sisters) were tested. There is a marked family stain, evident as soon as a

card index of those affected was prepared. The use of mercury and iodide of potash caused the lesions to at once improve and the disease has now been brought to such a state that there are no open lesions in any of the inhabitants except in the new cases that continue to develop from time to time and in those who neglect their treatment. The number of these cases is very few, as all those who are known to have the disease are under supervision and treatment, and any neglecting to take their treatment are punished. The disease is a very interesting chapter in syphilis. The common evidences of inherited syphilis, Hutchinson's teeth, snuffles, and the like are not seen at all. The women are not subject to miscarriage any more than those known not to have syphilis. The average age at the onset of the disease is 25.7 years. There is no record of a primary syphilitic sore having been seen in a Chamorro, to my knowledge, and no member of the enlisted force of the navy or marine corps has received syphilitic infection from a native of Guam. The evidences of syphilis, excepting iritis (primary) and certain of the affections of the brain and nervous system (dementia and tabes), have all been seen. Keratitis is fairly common, but yields readily to treatment; bone involvement is common and early paralytic brain conditions were seen; involvement of the liver and spleen and other organs was seen, and yielded promptly to mixed treatment. Though many attempts were made to demonstrate the presence of treponema none were successful. Salvarsan arrived in May, 1911, but at the time of my departure the older cases in which it had been tried, had not given any results. No history of syphilis could be obtained from any of the natives or from the Spaniards remaining on the island. We were satisfied that the original infection had taken place some generations ago. The evidences of involvement of the circulatory system were negative, only one

case of aneurysm was known to exist, and this was in a woman of about sixty years of age. It is not known whether a Wassermann was made in her case. The Wassermann was made in one hundred cases, not selected, and many of them had taken mixed treatment for about one year. At the time of my leaving we had 339 cases who had had the disease; one case was a leper and the gangosa lesions healed promptly under the use of mixed treatment. No lesions were found that differed from those seen in syphilis except that the disease presented none of the secondary skin eruptions and its course was not so severe as in untreated cases in our own people.

A Comparison of Certain Diseases Among Natives and in the Observer's Homeland .

KOREA.[9]—Intestinal diseases are less virulent, while throat diseases, measles, and scarlatina are more so. Lung diseases are more rapid in their progress. Empyema, more prevalent. Skin affections are more prevalent than in the United States. Syphilis usually of a milder form, chiefly manifest in nasal and palatal destruction, but rather uncommon elsewhere. Measles are common and severe; ear and intestinal complications occur frequently. General spinal and peripheral nerve lesions, more uncommon than in United States. Tabes has as yet not been observed. Simple cases of goiter are generally reported as uncommon and those with exophthalmic symptoms have not been observed. In Kangkai and that section of Korea simple goiter is quite common in various stages of development. The Koreans have a saying that anyone who drinks the water that drains from the decaying roots of the edible pine will develop the disease. Typhus is very common at Taiku and in the South generally, and it is apparently as common now as previously. Although the symptoms are not so serious as among foreigners, the Koreans are very much

afraid of it and recognize its contagious nature. Cases of rabies occur from time to time in most every section of Korea. For a number of years the Severance Hospital was kept in readiness to treat with virus any case that might be sent in. Recently the government hospital laboratories have instituted this department so that private institutions need not continue this work. Anyone now can obtain a full treatment for $3.75 gold. Gangrene of the fingers and toes was noticed in several cases of snake bite. One patient with a large patch of anesthesia on the leg attributed this to a snake bite some years before. Bites from centipedes only cause a swelling with urticaria-like spots and the pain goes away rapidly after the use of ammonia solution. There was no sprue seen in natives. Relapsing fever is fairly common about Taiku. Intestinal diseases, diseases of the bronchi, and skin diseases are more common here than in the United States. Endemic hemoptysis very common in the most northern province and now that we are making a systematic daily sputum examination the cases are increasing. Smallpox cases are seen every winter.

SAMOA.[1]—There are five diseases which are commonly met with; namely, granular conjunctivitis (trachoma), Samoan conjunctivitis (diplococci), meningitis, several forms, otitis media, purulent, and fish poisoning. Granular conjunctivitis presents all the complications and sequelæ of trachoma though clinically its features are a little less severe and its course a little less rapid than is usual in trachoma. Nevertheless, the two diseases are practically the same. The school children were examined by eversion of the lids and the different schools showed 30 per cent to 60 per cent of the children suffering from this disease. Over five hundred examinations were made. Blindness partial and complete is very common in Samoa and much of it has been thought to be due to this condition. Acute Samoan conjunctivitis

is a highly contagious endemic disease of the conjunctivæ ocular and palpebra; an acute purulent conjunctivitis. It affects whole families and villages and will recur many times unless controlled. Silver salts will cure even very severe cases in a few days. The condition closely simulates gonorrheal ophthalmia, but is less severe. It is caused by a diplococcus differing only slightly from the gonococcus but said to have different cultural reactions. (See article by Dr. P. S. Rossiter, U.S.N., *U. S. Naval Medical Bulletin,* 1909.)

Meningitis is one of the common causes of death in young children. More than six deaths occurred in one year out of a total of less than three hundred from this cause alone. Two of these cases were shown to have a turbid spinal fluid with many leukocytes and an intracellular diplococcus. They, however, failed to respond to an injection of Flexner's antimeningococcic serum. Three of these cases showed a clear fluid with a few mononuclear leukocytes and no bacteria. They were believed to be tuberculous. The others were of unknown origin. Convulsions general and prolonged were a prominent symptom. All children were well nourished and died a few hours after onset. It was with the greatest difficulty that the superstitious natives could be persuaded to let the doctor see these cases. They considered them hopeless from the onset. Otitis media is only moderately common among the natives and gives rise to very few complications and responds fairly well to treatment. Most of the cases are apparently caused by the native habit of cleaning the ears with a quill. Fungus infections of the external canal have not been observed.

Fish poisoning: A mollusk called "Matamalu" is used by the native as a food, when cooked. Occasionally a child will eat this before cooking. Symptoms of acute gastrointestinal irritation ensue followed by a peculiar

state of stupor and marked dyspnea not unlike a very severe attack of bronchial asthma. Death may ensue in a few hours. Recovery is the rule.

GUAM.[2]—Hypertrophy of the prostate is very rare. Varix of all kinds extremely rare. Pneumonia not very common, but when it occurs has a greater number of cases of empyema than is common with our people. For the number of cases of tuberculosis of the lungs that exist, the percentage of cases of involvement of the bones, peritoneum, meninges and skin is very small. Abdominal tumors are rare and the general surgical clinic was smaller than I have ever seen in a 12,000 population. Accident work was very rare and we had almost as many accidents among the few Japanese on the island as we had with all of the natives.

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APPENDIX

SURGERY OF THE SPLEEN

The Relation of the Spleen to Certain Anemias* (William J. Mayo).—Recently, as a result of the study of the pathology of the living, largely from material obtained at the operating table, more accurate knowledge of the function of the spleen has been gained although in this we are still woefully lacking as compared to our knowledge of the other organs of the body.

THE RELATION OF THE SPLEEN TO THE LIVER AND DIGESTIVE TRACT.—The spleen and liver are closely associated in function. The liver is essential to life, the spleen is not. The liver acts as a gigantic means of defense against poisons, both parasitic and chemical, which would otherwise reach the general circulation from the gastrointestinal tract through the radicals of the portal vein. This is well shown in cancer of the rectum and intestine, which through the portal circulation, often develops embolic processes in the liver though seldom in the lung. Cancer of the stomach, on the other hand, by reason of direct communications with the general circulation through the diaphragm as well as through the portal vein frequently develops secondary cancer in the lungs as well as in the liver.

The splenic artery arises from the celiac axis, the same source which supplies the pyloric end of the stomach and upper duodenum, the liver and pancreas, all of which are derivatives of the foregut, and all organs concerned in the proper preparation of food products for digestion and absorption, as in them also the venous return of the spleen becomes part of the portal circulation. The vascular system of the spleen is large and is curiously arranged, inasmuch as the walls of the blood vessels, except the endothelial lining, are absent and the blood comes in direct contact with the splenic pulp.

The spleen contains a considerable amount of nonstriated muscle fiber and elastic tissue, but only a very scanty supply of nerve tissue, and that largely from the sympathetic. Every organ of important internal secretion is very closely, if not organically associated with sympathetic nerve tissue. Note the adrenals and hypophysis, part glandular and part sympathetic ganglia. This close relationship of the glandular secretion with the sympathetic nervous system enables widespread effect, so that the internal secretions may be said to play on the sympathetic nervous system as the fingers play on a piano. The scanty nerve supply of the spleen shows that it does not produce an important internal secretion. Its function must be closely associated

*Jour. Indiana Med. Assn., Nov. 15, 1915, viii, 499-504. Abstracted from Collected Papers, Mayo Clinic, 1916.

with metabolism, shown by enlargement during the digestive period and contraction following digestion. That these physical changes are brought about through the blood stream seems assured since epinephrin solution in the circulation will cause the spleen to contract one-third in size, as noted by Elliott and Kanavel.[1]

The idea that the spleen is an obsolete organ of little function is not tenable, as Eccles[2] has pointed out. The outstanding fact in a retrogressing organ is the reduced blood supply. The tonsils, for example, were at one time supposed to be retrogressive, but the fact that the tonsil has five sources of blood supply shows that it is not obsolescent, yet it is not essential to life and when diseased has great potentiality for harm. This is quite analogous to the spleen.

It would appear that the spleen removes from the circulation not only cellular elements of definite food value, but also, when unable to properly care for these products, sends them to the liver for elaboration into energy-producing substances, on the one hand, and destruction of various toxic agents on the other, that nothing of value may be eliminated and that dangerous products, wherever produced, may be rendered harmless.

The relation of all animal life to food supply is of first importance. It is a trite saying that nature abhors waste. The amount of energy nature can produce in the living with a limited amount of food has no imitators in man's handiwork. One must confess that whatever his mental and moral deficiencies, and they are certainly great, as a machine, man has no equal. The degenerated cellular elements from the blood and even the food values of ingested parasites are conserved. It has been shown that the phagocytes of the body depend, to a considerable extent, on ingested bacteria for their nutrition (Hiss[3]), Stohrs and Adami have shown that the leukocytes of the body pass out on the free surface of the intestine and return loaded with bacteria and particles of fat, and that the pigmented areas of the liver are derived from the coloring matter of slaughtered bacteria. In the same manner the fluids of the intestinal tract are redistilled in the proximal colon after being used mechanically to float the food products down the small intestine and, that nothing may be wasted, bring them in contact with the valvulae conniventes, which are to man what roots are to a tree.

The close association of cirrhosis of the liver with enlargements of the spleen has long been noted. In primary cirrhosis of the liver the spleen is enlarged and in splenic anemia with splenomegalia the terminal stage shows cirrhosis of the liver. In some cases, much difficulty is experienced in determining whether the hepatic cirrhosis is primary and the splenomegalia secondary, or the contrary. Nearly thirty years ago Gregory[4] rather picturesquely stated that nature had three ways of protecting the organism against noxious agents: First, by absorption, destruction and elimination through natural processes; second, by encapsulation of such harmful substances as it was unable completely to destroy or eliminate, of which the encysted bullet is a

gross example; and third, by extrusion, as in the spontaneous opening and discharge of infective organisms in phlegmons. It would seem probable that in cirrhosis of the liver the second of these methods was in operation. It has been suggested that in chronic alcoholism, for example, the liver, finally unable to destroy and eliminate, attempts to encapsulate a diffuse poison and that the contraction of this scar tissue produces the cirrhosis. But cirrhosis of the liver is by no means confined to alcoholics. It is often seen in comparatively young people and those who have never used alcohol. It probably would not be far wrong to say that certain toxic substances circulating in the blood may be gathered into the spleen and sent thence to the liver for destruction, and that chronic hepatic insufficiency might eventually lead to the production of cirrhosis of the liver, on one hand, and on the other, show its effect on the spleen, as a splenomegaly with resulting anemia, as, no matter what the cause of the splenic hypertrophy may be, an increased capacity for destruction of the red cells seems liable to develop. Syphilitic cirrhosis of the liver with splenomegalia is an example of the nonalcoholic type of disease and splenectomy in these cases promptly relieves the anemia, although the spleen itself, on pathologic examination, may show no evidence of spirochetal action.

Certain it is that the removal of the spleen has been of very great benefit in some cases of cirrhosis of the liver, especially of the Hanot type. These experiences, however, have been too recent to enable any conclusion to be drawn, but among the group of splenic anemias in which a greatly enlarged spleen has been removed and cirrhosis of the liver was present with ascites, etc., patients have been apparently cured, and the cures have now lasted long enough to enable us to say that at least the cause of a progressive and heretofore fatal malady has been removed. We could not expect a cirrhosed liver to return to normal, but the progress of the cirrhotic process has been interrupted and the remaining hepatic tissue has been sufficient to carry on function. Of the important organs of the body, the liver is one of the few which has the power of regeneration. If half of the liver of a dog be removed, it will be restored in a few months. In the kidney regeneration does not take place. It is rather a hypertrophy of the original tissue of the kidney than a true reproduction of lost tissue from existing tissue which occurs under similar experimentation.

If we accept the idea that the spleen removes from the blood noxious agents, are we to conclude that all the circulatory blood must go through the spleen for this purpose; or is there an attraction between organs and the arterial supply of the body, that is, do certain organs definitely attract substances circulating in the blood? Rosenow[5] has shown, for example, that the streptococci cultured in the gall bladder are definitely attracted to the gall bladders of experimental animals when injected into the circulation. This is also equally true of other organs—the appendix, the stomach, etc., so that he has been able to

produce definite infections of organs with injections of bacteria properly cultured.

THE RELATION OF THE SPLEEN TO THE BLOOD.—The spleen is found in all red-blooded animals. The ancestral blood corpuscle, from which both red and white have their origin, is probably the mesenchyme cell, a form of lymphocyte which appears first in the fetal blood. The most primitive blood is, therefore, white blood. This is found in the fetus before the red blood appears. All animals that have only one kind of blood have white blood. As the scale of animal life ascends, red blood begins to appear and nearly all the conditions of the blood of the different anemias is the normal blood of some of the lower animals. In fetal life all of the lymphoid and adenoid structures of the body, the bone marrow, the spleen and in its early stage, probably also the liver, are blood-forming organs. The liver loses this function long before birth. In leukemia, all of these primitive organs, including the spleen and liver, for some unknown reason, begin to produce embryonic white blood, just as in cancer there is an unlimited production of embryonic epithelial cells and in sarcoma of embryonic connective-tissue cells. After birth, the spleen continues to produce a certain number of leukocytes, as shown by the fact that the splenic vein contains a higher percentage of leukocytes than the other veins of the body, but does not produce erythrocytes. Osler[6] states that after severe hemorrhages the spleen may temporarily produce red cells.

It has also been definitely shown that worn out red corpuscles are strained out in the spleen and destroyed; thus the splenic vein contains a higher percentage of hematin than other veins of the body. In disease we may surmise that excess of splenic function destroys red corpuscles which are not worn out and the condition becomes one which we speak of as splenic anemia or hypersplenism, and that the exceedingly rare condition of excess of red cells in the blood called polycythemia may be due to deficiency of function of the spleen and associated organs—a hyposplenism.[7] This explanation, however, is undoubtedly too simple and does not take into account the possibility of the spleen interfering in some unknown manner with the production of red cells in the bone marrow. It is more probable, however, that in certain conditions of disease red cells are sensitized in other tissues, as shown by the increased fragility of the red cells (Chauffard[8] and Widal[9]), and are then destroyed in the spleen. Since, when the spleen is removed in cases of primary anemia, pernicious anemia and in hemolytic jaundice, it is found crowded with disorganized erythrocytes, this hypothesis seems the more logical.

Of great significance is the knowledge that the spleen and possibly other organs, of themselves not necessary to life, may be *the* link easily broken in an otherwise fatal chain. From the fact that the spleen is not necessary to life and yet that its removal may definitely check certain hopelessly progressive blood dyscrasias, one must conclude that the spleen is not the cause but rather the agent of destruction, as in

hemolytic jaundice, and that when the spleen is removed the noxious substances are rendered innocuous elsewhere under more favorable conditions, although what becomes of these toxic agents after the spleen is removed we have no means of knowing. Be this as it may, clinical experience has definitely shown that many of those anemias associated primarily with an enlarged spleen and secondarily with cirrhosis of the liver are definitely cured by removal of the spleen.

ANEMIAS OF POSSIBLE SPLENIC ORIGIN.—In grouping these anemias much difficulty is experienced and the accepted terms of designation concern, to a great extent, syndromes.

Splenic Anemia.—The group called the splenic anemias shows rather a definite clinical picture, for example, secondary anemia, leukopenia, enlarged spleen, hemorrhage from the stomach and, in the late stages, the characteristics described by Banti,[10] cirrhosis of the liver, ascites, etc., a disease most common in young adults. Children, however, are not infrequently subject to the disease of the adult type and it is possible that the "pseudoleukemic anemia" of infants or von Jaksch's disease is also a manifestation of the same condition (Giffin[11]). In von Jaksch's disease there is a leukocytosis which is chiefly a lymphocytosis together with a diminution of erythrocytes, a large spleen and cachexia. In this condition infants, for physiologic reasons, usually show an excess of leukocytes up to 30,000 or more, older children more often developing the condition seen in adults with leukopenia, but even in adults the leukocytes may be in excess in otherwise typical cases of splenic anemia.

In our clinic to Sept. 20, 1915, seventy-one splenectomies have been performed with six deaths. Twenty-nine were in cases of definite splenic anemia. All the patients recovering from the operation, with five exceptions, have remained quite well in spite of the fact that some were in the late stages of the disease, that is, markedly advanced hepatic cirrhosis, ascites, and jaundice (Giffin[12]).

Gaucher's Disease.—Gaucher's disease or large-cell splenomegalia is closely associated with splenic anemia and early removal of the spleen will probably cure the condition. Gaucher's disease is characterized by a slowly growing spleen, which eventually becomes of great size, with secondary anemia and, in the terminal stages, the characteristic endothelial growths appear in the liver, lymph nodes and bone marrow. According to Brill and Mandelbaum,[13] it always begins before the thirteenth year and averages twenty years before a fatal termination, usually a terminal complication.

Hemolytic Jaundice.—That hemolytic jaundice, in the great majority of cases, is due to hypersplenism may now be accepted. Whether the spleen is acting on its own initiative or through stimulation of the blood in destroying the red cells we have at present no definite knowledge.

Five patients with hemolytic jaundice have been operated on in our clinic. None of these cases was of the familial type, though all had begun in childhood. In this condition there is an enlarged spleen and

constant moderate jaundice of the acholuric type, that is, there is bile in the stool, absence of itching of the skin and freedom from all symptoms of obstructive jaundice. Usually there is increased fragility of the red cells and an excess of urobilin and urobilinogen in the urine but no bilirubin. Exacerbations are often preceded by typical crises somewhat resembling gallstone colic, with increased temperature, malaise, headache, loss of appetite and an increase of the jaundice. During the crisis the spleen is enlarged and tender. In three of our patients, two under 20 years of age, gallstones were present. Improvement after splenectomy in our cases was a most remarkable phenomenon. The jaundice began to clear within twenty-four hours following the splenectomy and in four days had completely disappeared, with complete restoration of well-being.[14]

There have been attempts, more or less successful, to demonstrate essential differences between the familial hemolytic jaundice of Minkowski[15] and the acquired disease of Hayem[16] and Widal.[9] Chauffard[8] says that in the congenital type the disease shows itself more or less distinctly from birth, and the patients are "more icteric than sick," while the acquired type begins in adolescence and the patient is "more sick than icteric." The congenital type may last for a lifetime with the patient in fair health; the acquired type is progressive and leads to death through anemia and its complications.

There is a remarkable similarity between cirrhosis of the liver with enlargement of the spleen and splenomegalia with cirrhosis of the liver. Just so are we impressed by the similarity between acquired hemolytic jaundice and Hanot's cirrhosis of the liver. Both are more common in young adults and are more or less chronic in their course, the patients with hemolytic jaundice frequently living out a life expectancy, and those with Hanot's cirrhosis lasting from four to ten years. Both have enlarged spleens accompanied by jaundice, often slight, but with exacerbations, both may have crises marked by pain in the region of the liver, and in both ascites is usually absent. It is very evident that there is some connection between hemolytic jaundice and Hanot's cirrhosis. That hemolytic jaundice is definitely cured by splenectomy can be stated as a fact, and growing experience leads to the conclusion that improvement and sometimes definite cure in Hanot's type of cirrhosis of the liver may be effected by splenectomy, although in confusing types of the disease with hemophilic tendencies one must be guarded in advising surgical treatment.

Pernicious Anemia.—It has been known for many years that pernicious anemia is often accompanied by a large spleen. Eppinger[17] first pointed out that after the spleen was removed, in pernicious anemia an extraordinary improvement in the condition of the blood was usually noted, and experience has borne out Eppinger's observations.

Cabot,[18] in discussing six splenectomies for pernicious anemia, said he had never seen such great improvement produced by any medicinal agent as had followed splenectomy; that no medicament with which

he was acquainted would bring up and hold the red cells above four million. Four of his patients had been incapacitated for two years or more and within a few months following splenectomy they were able to go back to work. He points out that sufficient time has not elapsed to show that these patients are cured, but even as a means of producing a prolonged interval of well-being the splenectomies have been worth while.

It is true that the spinal cord changes in pernicious anemia have not been benefited by splenectomy and they have even progressed after splenectomy in spite of the general improvement of the patient. Also the blood in the splenectomized patients so far observed did not entirely lose the characteristic pernicious cells nor could we expect it to do so. We can not expect the operation to overcome structural changes in organs which have been permanently damaged, and up to the present time the only cases which have been subjected to operation have been largely those in advanced stages of the disease. Experience shows that splenectomy should be resorted to early and in these cases cure may at least be hoped for. The spleen has been removed in twelve of our cases of pernicious anemia (Sept. 20, 1915). The improvement in some of these cases has been remarkable, but not enough time has yet elapsed to warrant any definite statements being made.

In reviewing the basic facts of splenic anemia, hemolytic jaundice and pernicious anemia, the one fact that stands out is that there is a destruction of the red blood cells and that this hemolytic change is accompanied by physical changes in the spleen. It is interesting in this connection that in sixteen of the seventy-one cases of splenectomy in our clinic gallstones were found, and all were in the groups of anemias (forty-seven cases).

In addition to these rather definite groups of cases, enlargement of the spleen is found under conditions for which through lack of knowledge we have no ready classification, as in certain diseases with hemophiliac and purpuric tendencies, and it may eventually be shown that the spleen is associated with these conditions of the blood. Patients with anemia associated with splenomegalia and having high temperature, such as are seen in the pregnant state, require further study. I shall not discuss infections of the spleen, bacterial and protozoal, which give rise to surgical conditions, nor those anomalies and tumors, of which we have observed some remarkable examples. I have purposely omitted reference to the pathology of the spleen itself, because this study is not as yet sufficiently advanced to be more than suggestive. Wilson[19] is now studying our cases and is able to show that there is a true microscopic pathology in these diseases which it is hoped will prove to be characteristic.

Our knowledge of splenic disease, like most of our knowledge of organs in concealed situations, has been the result of study of living pathology under surgical conditions. Postmortem examinations, which were once looked on as the final word on disease processes, have too

often not shown the chronic diseases from which people suffered during life, but only the disease from which they died. Experimentation on animals, like the postmortem, has been of enormous value in laying a foundation for medicine, but as the animals themselves were not diseased, the conditions favorable to exact knowledge were not present, and experimentation is now seen in its proper light as an aid to understanding but not as the final solution of problems of the living. But the living pathology brought forth by the surgeon has in this field, as in others, enabled medical research to produce most valuable material for study and has within the last few years advanced our knowledge of the physiology, pathology, and therapeutics of diseased conditions of the spleen more than all else that has been done since the beginning of time.

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The Spleen.—ITS ASSOCIATION WITH THE LIVER AND ITS RELATION TO CERTAIN CONDITIONS OF THE BLOOD (WILLIAM J. MAYO).*—For many years when doing abdominal operations, if it could be done without risk to the patient, it has been my practice to make a careful manual ex-

*Abstracted from Jour. Am. Med. Assn., March 4, 1916, lxvi, 716-721.

amination of the contents of the abdomen. Thus I have been impressed with the fact that the spleen shows enlargements and other physical changes rather regularly in connection with diseases of the liver and of the blood. In papers on this subject written at various times, attention has been called to the fallacy of the physical examination of the spleen, and it may be said that unless the spleen is sufficiently enlarged to be felt beyond the free border of the costal margin, the enlargement would probably not be recognized. At times careful physical examination by percussion, for instance, has apparently revealed the area of splenic dullness, but on the opening of the abdomen the fact showed how fallacious percussion had been. Faith in these methods has been due to the fact that in certain diseases, like typhoid, which often end in death, the spleen is generally enlarged, and with this knowledge at hand a diagnosis by percussion has been made and proved correct at necropsy. By means of the roentgen ray, the possibilities of accurately examining the spleen for such enlargements are developing. The roentgenologist has been able to outline the kidneys, the liver, etc., as well as the digestive and thoracic organs, with a marvelous degree of accuracy, and we may expect that he will accomplish the same for the spleen in the near future. The humiliating mistakes made by surgeons, of which we have made our share, of diagnosing as splenic enlargement a cancer of the stomach or colon or tumor of the kidney, are now avoidable by careful roentgenographic exclusion of these organs.

The function of defense of the liver is shown by Adami,[1] who points out that the leukocytes of the living body pass out on the free mucous surface of the duodenum and upper jejunum, and pick up bacteria which they usually destroy, but should they fail to destroy them, the liver becomes the agent of destruction, and the pigmented areas in the liver are derived from such slaughtered bacteria. Research has shown that the phagocytes of the body are developed in direct response to bacterial invasion. As Vaughan[2] has pointed out, the period of incubation of a disease is the time which is necessary to develop or train leukocytes to bodily defense. He shows that the reaction we call typhoid fever is a defense manifestation, and that preventive serums, such as vaccination for smallpox, typhoid, etc., act to educate the cells of the body to resistance against certain organisms and to change the proteins of the body so that they no longer act as food for these bacteria. Vaughan advances the theory that bacteria are not vegetable organisms but parasitic growths in a distinct class by themselves. Eccles[3] suggests that the phagocytes of the body live on bacteria, and that the food values of the bacteria are thus conserved. He looks on the tonsils and other lymphoid structures, such as the appendix, as what may be called chronic vaccinators, since through the tonsils are constantly permitted to pass a certain number of bacteria which stimulate the development of phagocytes. This shows that a moderate re-

action in the tonsil may not always be the cause of an impending generalized infection, but rather an early defense manifestation.

It is interesting to note how the spleen is controlled in its function. Stimulation and control is exerted over the voluntary parts of the body by the cerebrospinal nervous system, over the involuntary or vegetative part of the body by the sympathetic ganglion acted on the internal secretions. In addition, there is the essential rhythm of nonstriated muscle. The vegetative part of the body was well developed before the organism had reached the stage of a cerebrospinal nervous system, a comparatively late development. The sympathetic nervous system, probably mesoblastic in origin and now closely associated with the cerebrospinal nervous system, acts in association with the internal secretion, and all organs of important internal secretion, such as the suprarenals and the hypophysis, in which gland and sympathetic ganglia are present, are so closely associated as to form a single organ.

That the spleen does not have an important internal secretion is shown by the fact that its removal does not deprive the body of any important constituent; and that it is not under the complete control of the nervous system is shown by its extremely scanty supply from Auerbach's plexus. But the spleen does have a considerable amount of nonstriated muscle fiber, and it is altogether probable that this muscle has an important function and possibly is responsible for the digestive rhythmic change in the size of the spleen.

To go further into the interesting phase of a subject to which Keith has called attention would lead us far afield. Suffice to say that the rhythmic waves are automatically checked by sphincters, and in failure of rhythmic intestinal movement and sphincter control may lie the secret of so-called intestinal intoxication and neurasthenias of intestinal origin. The presence of nonstriated muscle in the spleen gives important evidence of the primary relationship of the spleen to the digestive system.

ENLARGEMENTS OF THE SPLEEN.—These may be divided into four groups: (1) new growths, (2) infections, (3) enlargements associated with hepatic disease, and (4) those associated with the blood.

1. *New Growths.*—The first will not be considered at this time. I shall very briefly take up the results of splenectomy in some of the diseases in the latter three groups.

2. *Infections.*—In so-called primary tuberculosis of the spleen the removal of the organ has cured a few patients. It is quite likely, however, that tuberculosis is practically never, in reality, primary in the spleen, and that this diagnosis is the result of insufficient clinical study. Our one patient of this type died from general miliary tuberculosis after a temporary improvement of several months. In three instances we have removed greatly hypertrophied spleens from patients suffering with chronic syphilis and marked anemia. In one of these, specific treatment had been carried out for two years, in another for six months, without satisfactory improvement in the general condition or

the anemia. Following splenectomy, there was marvelous improvement of the anemia in all of them.

Marked enlargement of the spleen is quite frequently present in patients with a history of chronic recurring septic conditions. These spleens are usually smaller than those of splenic anemia, although occasionally we have seen a very large spleen filled with infarcts. We have removed the spleen from seven patients with histories of chronic recurring sepsis. Patients of this type usually have a lowered resistance, and cardiorenal insufficiency is most likely to influence the ultimate prognosis unfavorably.

3. *Splenic Enlargements Associated with Hepatic Disease.*—Primary cirrhosis of the liver accompanied by enlargement of the spleen is remarkably similar to primary enlargement of the spleen with secondary cirrhosis of the liver, and in the late stages of either disease it is very difficult to determine in a given case whether the process was primary in the liver or in the spleen. In the same way it is difficult to differentiate between hypertrophic biliary cirrhosis of the liver of the Hanot type in which there is jaundice, and hematogenous jaundice, which has its origin in the spleen. Primary biliary cirrhosis of the Hanot type is doubtless a rare disease. It may last for from six to ten years, and the spleen as well as the liver is always enlarged. It is a disease of young adult life. As in hemolytic jaundice, there are crises marked by tenderness in the region of the liver and spleen with a temporary increase of jaundice. In a small number of instances in which Hanot's cirrhosis has been diagnosed, the spleen has been removed with undoubted benefit, and possible cure. We have seen one such case. Hemolytic jaundice can usually be differentiated by the fact that the fragility of the red cells in the peripheral circulation is decreased, whereas in cirrhosis of the liver the resistance of the red cells is usually increased. In hemolytic jaundice urobilin, but not bile, is present in the urine, and the jaundice is not associated with itching. Yet to what extent these cases of biliary cirrhosis have been confused with those of hematogenous jaundice of splenic origin, and to what extent the syndrome which has been called Hanot's cirrhosis of the liver actually exists, further investigation must decide.

In four instances we have removed a greatly enlarged spleen in patients suffering from portal cirrhosis of the liver. It is too early to know whether or not the end-results will justify the operation. Three of our patients, however, have markedly improved, and the ascites and anemia have disappeared.

It must be evident to all that the spleen is only one avenue by which noxious agents may reach the liver and cause a cirrhosis. It is probable that a large number of cirrhoses have their origin in the gastrointestinal tract, but, no matter what the portal of entry may be, there is usually a concomitant enlargement of the spleen.

In general, the common forms of cirrhosis of the liver may be divided into three classes: first, portal cirrhosis, in which the toxic ma-

terial obtains entrance through the portal system and the connective tissue proliferation advances from the portal spaces and in which the symptoms are those of portal obstruction; second, biliary cirrhosis, in which the infectious agent may be either ascending from the biliary tract or hematogenous, and in which the most pronounced clinical sign is chronic jaundice, while portal obstruction comes on late; third, mixed types, which are undoubtedly not rare and in which a preoperative diagnosis is often impossible.[19]

4. *The Blood.*—Splenic Anemia: Patients with anemias associated with enlargements of the spleen are cured or greatly benefited by splenectomy. The syndrome called splenic anemia, the terminal stage of which is known as Banti's disease, may be cured by removal of the spleen in a high percentage of cases.

Clinically, splenic anemia is an entity. The spleen is large; there is a definite anemia showing a reduction of reds and a low hemoglobin, and the disease is progressive, ending in death. The process may be exceedingly slow and at times completely interrupted in its clinical symptoms for several years; but all enlargements of the spleen that can not be shown to have some other definite cause must be looked on as incipient splenic anemia. The future history of such cases will finally prove the large majority of them to be of this character. Hemorrhage from the stomach at times is one of the early symptoms, even before the spleen is much enlarged. These cases of gastric hemorrhage in which no other origin can be found should be carefully examined for evidence of splenic anemia. In the later stages, after ascites has developed, and the liver has become cirrhosed, but little may be expected from the removal of the spleen, and yet several of our patients in this terminal condition have been cured by splenectomy (Fig. 4).

Splenic anemia with adult characteristics is not infrequently seen in childhood, and is promptly relieved by splenectomy. It is quite probable that the pseudoleukemic anemia of von Jaksch is merely the infantile type of splenic anemia, the increased leukocytes (30,000 or more) being merely a difference in the reaction of the blood due to infancy (Giffin). It may be said in this connection that while leukopenia is usually present in splenic anemia, there are a number of instances in which patients having a moderate leukocytosis (20,000 or more) have been operated on at various ages and remained well afterward. Several such patients operated on by us were previously diagnosed as having true leukemia, and were treated for it.

Preliminary to splenectomy and, in some cases, following it, transfusion of blood may be necessary. The blood of the donor should always be tested in connection with the recipient for agglutination and hemolysis.

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The following is from an article on "The Liver and Its Cirrhoses" by William J. Mayo, published in the *Journal of the American Medical Association,* May 11, 1918.

"In fifty-one cases of splenic anemia, in which we have removed the greatly enlarged spleen, the relief to the portal circulation has been immediate. In those cases in which cirrhosis was present, the ascites has now disappeared and several patients have lived for years, one for more than seven, in excellent health. The evidence here points to the fact that the original poison was carried to the liver from the spleen and theoretically

is probably a protein derivative, filtered from the blood. But in five cases of portal cirrhosis with ascites, in which I removed the enlarged spleen, the four patients who recovered were greatly improved both as to their general condition and as to the relief of the ascites. On first thought, it seemed probable that in the removal of such a spleen I had checked the source of poisoning. On further consideration, another explanation appears possible or even probable. With the removal of the spleen, all the blood from the general circulation, which otherwise would have been sent to the liver through the splenic vein, was prevented from going there, and in this manner sufficient blood had been diverted from the liver to relieve the portal circulation. Possibly both views are more or less correct. The results in these cases should encourage us to splenectomize in suitable cases of portal cirrhosis in the future, especially when the spleen is enlarged."

Giffin, in 1912, commenting on twenty-seven cases of splenectomy, divided them into three groups: (1) splenic anemia, (2) infectious splenomegaly, and (3) such as wandering spleen, tuberculosis, cirrhosis of the liver, and pernicious anemia.

Clinical Observations Concerning Twenty-seven Cases of Splenectomy (H. Z. Giffin, Mayo Clinic).*—The association of enlarged spleen with anemia occurs in so many diseases and in such a variety of abdominal conditions that a fuller knowledge will be necessary before one can arrive at a correct classification of splenomegaly. The results of medical, surgical, pathological, and experimental experience must be reported abundantly before a correct grouping can be even attempted.

That a certain picture conforming to splenic anemia as it is clinically described presents itself there is, of course, no doubt. However, the many factors that are discussed by writers on the etiology of this condition at once make one question the advisability of stamping a given case with a certain stencil. Syphilis, malaria, passive congestion as a result of portal obstruction, thrombosis of the splenic or portal veins, the occurrence of Leischmann-Donovan bodies, the action of extraneous toxins, the occurrence of hemolysis, the existence of an undemonstrated infectious agent—these have all been considered as factors in the causation of certain cases. And there must be added to this list, after a consideration of the cases herewith reviewed, what appears to be more than an accidental association of disease of the gall bladder, with cases that can properly be diagnosticated clinically as splenic anemia. Moreover, at one extreme, there are many histories of short duration or those without the typical symptomatology and cases with atypical blood count, while at the other extreme there are instances in which cirrhosis of the liver seems to form a slightly more prominent part of the picture than the changes in the spleen. And

*Abstracted from Am. Jour. Med. Sc., June, 1913, cxlv, No. 6, 781.

apart from the clinical and etiological aspects there is confusion on the pathological side. The examination of spleens removed from patients regarded from the clinical standpoint as cases of typical splenic anemia reveals no constant histologic picture. Connective tissue increase is the common finding, but endothelial or lymphocytic hyperplasia may predominate to such a degree that the picture may even simulate a true tumor.

Clinical Notes on Splenectomy (H. Z. Giffin, Mayo Clinic).*—Many types of splenomegaly are necessarily represented in this series and any classification of the cases is, of course, open to discussion and criticism. On the basis of their clinical and pathologic characteristics, they will be presented in groups as follows:

SPLENECTOMY, APRIL 6, 1904-JUNE 9, 1915

1.	Splenic anemia (pathologically diffuse fibrosis)	27 cases
2.	Gaucher's disease (endothelioid hyperplasia)	3 cases†
3.	Pernicious anemia	7 cases
4.	Hemolytic anemia (marked splenomegaly)	2 cases
5.	Secondary infectious or septic splenomegaly	5 cases
6.	Lues (marked splenomegaly)	2 cases
7.	Acquired hemolytic (hematohepatogenous) jaundice.	2 cases
8.	Cirrhosis of liver	1 case
9.	Myelocytic leukemia	1 case
10.	Lymphoma or lymphosarcoma	3 cases
11.	Tuberculosis of spleen	1 case
12.	Wandering spleen	2 cases
13.	Acute febrile nonseptic? splenomegaly	1 case
14.	Splenomegaly with marked eosinophilia	1 case
	Total	58 cases

Splenic Anemia.—In this group have been placed the 27 patients in whom the enlargement of the spleen was very great and in whom splenomegaly seemed to be the primary condition. The development of a severe type of anemia with low color index and the absence of leukocytosis were regarded as essential. Hematemesis occurred in a majority of the cases. Pathologically all the spleens showed an increase of connective tissue. There were 3 operative deaths in the group, while the total number of deaths was 8 in ten years. Hemorrhage was the cause of death in 2 instances, in 1 case occurring one year after operation and in the other, five and one-half years. In 3 other instances hemorrhage occurred 2 and 3 times at different periods after operation, but the patients are at present in good health. It is, therefore, evident that the patients in this group had a low operative risk and an excellent prospect of cure.

Gaucher's Disease.—Our 3 cases in which the spleen showed evidence of endothelioid hyperplasia occurred early in the series. We have been unable to obtain a history of familial tendency in any of them. One of these patients is in excellent health seven years following operation. In 2 patients the spleen had probably been enlarged since adolescence.

Pernicious Anemia.—Seven patients with pernicious anemia have been operated on in our clinic since August, 1914, with one operative death.

*Abstracted from Ann. Surg., Aug., 1915.

†Two of these cases have been questioned. A more detailed report will be published later.

A second patient died two months after operation with severe anemia. The third patient, two and one-half months after operation, is in very good health with hemoglobin at 70 per cent. In the fourth patient the condition of the blood rapidly improved after the operation and the hemoglobin was 75 per cent in three months. The fifth patient, nine months after operation, has gained 23 pounds, the hemoglobin is 70 per cent and the red blood count 3,026,000. The last 2 patients are at present in the hospital. It is, therefore, seen that in our small series of splenectomies for pernicious anemia there was 1 operative death, 1 death at two months, while 3 of the patients showed marked temporary improvement. Many patients with pernicious anemia have presented themselves for diagnosis, but we have hesitated to advise surgical treatment.

Hemolytic Anemia with Very Much Enlarged Spleen.—There were two cases of an unusual type in which the anemia was severe in character but in which the typical count of true pernicious anemia was not present and in which the spleen was very much larger than that ordinarily seen in pernicious anemia. The first patient (A-7040) was operated on February 10, 1910. The blood count showed a rather high color index, not, however, above 1, and there were a few normoblasts and megaloblasts in the smears. The spleen was very large, weighing 1640 grams. After operation showers of normoblasts occurred, a finding which is quite unusual in other types of splenomegaly save that of pernicious anemia. The second patient was operated on January 23, 1915. The spleen was enlarged early in the history of the disease, apparently before the development of anemia, the blood findings were similar to those of the first patient and the spleen was large, weighing 1120 grams.

It is true that these 2 cases may in reality be pernicious anemia, but the great size of the spleen, the fact that at no time was the blood typical of pernicious anemia, and the further observation that the enlargement of the spleen occurred early in the disease, would rather lead to the conclusion that they belong to a separate group in the production of which a disturbance of splenic function may have been primary and in which the reaction of the bone marrow was different from that in splenic anemia.

Secondary Infections or Septic Splenomegaly.—Under this heading have been placed 5 cases in which the enlargement of the spleen was not marked, in which the splenomegaly did not seem to be a primary factor in the production of anemia and in which there was evidence of preceding abdominal or systemic sepsis. One of these patients is in good health five years following operation.

Lues with Splenomegaly.—There were two instances in which large nongummatous spleens together with secondary types of anemia were present in patients with strong positive Wassermann reactions. In one of these the liver was smooth and specific treatment had been given elsewhere without benefit. Splenectomy was followed by marked im-

provement. In the other instance large palpable gummata were present in the liver. These were very much reduced by specific treatment before operation but the size of the spleen and the degree of anemia were not affected. In this case improvement has also been marked since splenectomy.

Acquired Hemolytic (Hematohepatogenous) Jaundice.—Two cases have been classified as hemolytic jaundice. It is possible that both of them might also be regarded as advanced forms of cholangitis with cirrhosis of the liver. The chronic jaundice, however, was prominent in these patients and the anemia was marked.

Cirrhosis of the Liver.—One case has been regarded as cirrhosis of the liver. In this patient neither was the spleen large, nor the anemia marked. Advanced cirrhosis of the liver was found at operation.

Myelocytic Leukemia.—A patient classified in our report of 1913 as a case of splenic anemia and so regarded by careful observers in other clinics, but of whom it was noted at the time that the blood picture was not entirely satisfactory for this grouping, continued to be in fairly good health for five and one-half years, after which the leukocyte count become increased to 64,000 with 14 per cent of myelocytes.

Lymphoma or Lymphosarcoma.—Our series includes 2 cases of lymphosarcoma of the spleen. One of the patients remained well for several years, but finally died with generalized sarcomatosis nine years after operation. The second patient was operated on July 3, 1914, at which time there was no evidence of metastases. After operation, however, general glandular enlargement rapidly occurred and death supervened five months later. A third patient presenting a decided lymphocytic hyperplasia pathologically but no definite evidence of malignancy is well eight years after operation. This case may be benign.

Tuberculosis of the Spleen.—In 1904, a large spleen which proved to be tuberculous was removed from a patient who at the time of operation gave no definite evidence of tuberculosis elsewhere in the body.

Wandering Spleen.—Two cases of this type were operated on because of pain resulting from twisted pedicle. These patients are both alive and well three and seven years following operation.

Acute Febrile Nonseptic Splenomegaly.—Several of the cases in this series were very unusual in their clinical manifestations and in the combination of conditions present. One of them was analogous in many ways to those cases occurring in Egypt and reported as Egyptian splenomegaly and deserves detailed description.

> The patient was a man, aged thirty years, who gave a history in which there was no record of previous disease. He had seemed to be toxic and somewhat stupid for 6 or 8 weeks, while a remittent fever reaching 103° had been present. There had been abdominal enlargement for only 2 weeks, but no history of hematemesis, while ascites was present at the time of examination and the spleen could be felt on ballottement. Wassermann test, Widal

reaction, blood cultures, etc., were negative. In spite of the history of fever and the acute course of the disease, there was no leukocytosis but a definite leukopenia with a relative increase of lymphocytes and an anemia of the secondary type with hemoglobin at 70 per cent. The patient remained under observation for 3 months, the condition became less acute in character, and splenectomy was finally decided on. The spleen was very large, weighing 1940 grams, and the liver was somewhat cirrhotic. (The patient remained weak after operation, had 3 hemorrhages from the bowels, and finally died 5 months following operation.) The acute course, the presence of high fever, the rapid development of a very large spleen and ascites, the absence of leukocytosis and other evidence of sepsis and the absence of jaundice formulate the picture of a most unusual type of splenomegaly.

Splenomegaly with Marked Eosinophilia.—As far as we have been able to determine there is no case of this type to be found in the literature.

This patient was a man, aged thirty-one years. He was first seen in our Clinic in March, 1913. He had had a continued fever which was diagnosed as typhoid eight years previous, and had complained of weakness since that time. Transitory edema had been present for ten months and had become extreme within ten days. At the time of his first visit there was a general anasarca, on account of which he was placed on milk diet, and the edema disappeared in ten days. The blood count at the time showed a secondary type of anemia with hemoglobin at 69 per cent and a leukocyte count of 15,400, while the most remarkable feature was the presence of a 66 per cent eosinophilia. The patient was under observation for three months, during which time many blood counts were made and verified by experienced hematologists and the eosinophiles varied from 58 to 77 per cent. Wassermann tests were negative; stools were negative; and the examination of muscle for trichinæ was also negative, although not entirely satisfactory. The great enlargement of the spleen persisted and operation was finally decided on and performed in July, 1914. The spleen weighed 2110 grams. The patient has done well since the operation; his leukocyte count, however, has risen to 138,000, of which from 75 to 80 per cent are eosinophiles. There is very little basis for speculation at to the possible etiology of this unique case.

RESUME.—Our series of 58 cases includes 27 of splenic anemia, 3 of the Gaucher type of splenic anemia, 7 of pernicious anemia, 2 of hemolytic jaundice, 5 of secondary infectious or septic splenomegaly, 2 of an unclassified type of hemolytic anemia with marked splenomegaly, 2 of lues, 3 of sarcoma or lymphoma, 2 wandering spleens and 1 each of myelocytic leukemia, cirrhosis of the liver and tuberculosis of the spleen. In addition, it includes 1 case of acute febrile nonseptic splenomegaly

which is analogous in its clinical course to Egyptian splenomegaly, and 1 case in which splenomegaly was associated with an extremely high eosinophilic count. Splenic anemia is, in our experience, most favorable for surgical treatment. The operative risk is relatively low and the prospect for a return to normal health excellent. Three of the 7 patients with pernicious anemia have shown temporary improvement up to 9 months after splenectomy. Removal of the spleen in nongummatous splenomegaly associated with syphilis has been attended with excellent results in two instances.

Pathology of Spleens Removed for Certain Abnormal Conditions of the Blood (Louis B. Wilson, Mayo Clinic).*—This study is a continuation of a previous report[1] which covered the pathologic examination of 26 spleens removed at operation or autopsy in the Mayo Clinic, between November 14, 1905, and November 1, 1912, from patients on 18 of whom a more or less positive clinical diagnosis of splenic anemia had been made, and of two "wandering spleens" removed at operation within the same period, and of 31 more spleens removed at operation, between December 3, 1912, and June 9, 1915. Giffin's[2] grouping is observed in the following pathologic protocols:

SUMMARY OF PROTOCOLS OF GROUP 1—SPLENIC ANEMIA.—It will be seen from the above proctocols that the average age of the patients with a blood picture of splenic anemia at the time of operation was thirty-six years. The average duration of symptoms was 32 months. The average weight of the spleen was 1130 grams. This is a little higher than the average weight (1040 grams) of the spleens from our positive splenic anemia (revised clinical classification) cases reported in 1913. The average of the two groups is 1093 grams. Few of the specimens equal the weights given by Lyon,[3] who states that the average weight is 62 ounces (1860 grams). This discrepancy is probably due to the fact that Lyon's figures are drawn largely from autopsy reports, while ours are from operative material, the spleen continuing to enlarge until death. In general the change in the shape of the spleen is not so marked as the change in size. In other words, the hypertrophy is evenly diffuse except in those cases in which infarcts have occurred. The maintenance of the notch is important from the standpoint of clinical diagnosis.

Histologically, the most constant features are the marked reduction of the pulp and lymphoid tissue with the great increase of reticulum and the almost constant presence of amyloid degeneration and arteriosclerosis. Whether the diffuse hypertrophic fibrosis is the result of inflammatory changes has not been accurately determined. I see no reason at present, however, to change from the commonly accepted theory that the process is one of low grade chronic inflammation. In this connection it may be noted that Bunting has isolated a diphtheroid organism in pure culture in four out of twelve tubes shown from the spleen in our Case XII.

*Abstracted from Ann. Surg., Aug., 1915.

SUMMARY OF PROTOCOLS OF GROUP 2—ACQUIRED PERNICIOUS ANEMIA.—The average age of patients with pernicious anemia was forty-four years at the time of operation. The average duration of symptoms was 27 months. The average weight of the spleens removed was 463 grams. Only one was less than normal (195 grams).[4] The increase in weight is out of harmony with our conception of the atrophy usually found in the spleen in cases of pernicious anemia.[5] Here again the discrepancy is probably accounted for by the fact that in the last stages of pernicious anemia the spleen becomes atrophic, while our figures, based on operative cases, show an increased weight of the organ.

Cytologically the increase is mostly in the lymphoid tissue, though it is worthy of note that in one case (Case III) there was a well marked fibrosis, this spleen weighing almost twice the average weight of the glands in the series. The almost entire absence of pigment in these relatively early stage cases is again in contradiction to the usually accepted statement that in cases of pernicious anemia the spleen is pigmented.

GENERAL SUMMARY OF THE LAST SEVEN GROUPS.—The cases of hemolytic anemia, lues, and hemolytic jaundice resemble pathologically the cases of splenic anemia. The cases of secondary infection, lymphosarcoma, acute febrile nonseptic splenomegaly, and splenomegaly with eosinophilia have little pathologic relationship to either splenic anemia or pernicious anemia. The lymphosarcoma case is a typical lymphoma whose malignancy was shown clinically. The other three cases give the general picture of an intense acute or subacute infection, causing hypertrophy and hyperplasia of all the parenchymal elements of the spleen without material increase in the reticulum.

Our knowledge of the pathology of splenomegaly associated with chronic changes in the blood has made slow progress, largely because—except in rare instances—we have been unable to study spleens from such cases until the later or terminal stage of the diseases has been reached. Now that splenectomies are becoming more common, it is fair to assume that clinicians will be on the lookout for large spleens in all cases of pathologic conditions of the blood and that we may hope for opportunity to study early pathologic changes in the glands removed at operation. If any progress is to be made, however, we must sharply differentiate the relative changes in the various histologic elements of the spleen and these changes must be studied in correlation with accurately observed clinical phenomena. At present the clinical diagnoses of splenic anemia, pernicious anemia, secondary infectious anemia, hemolytic jaundice, Gaucher's disease, etc., are all lacking in clearness, a condition which must be materially improved upon before an instructive parallel may be shown—if, indeed, any exist—between the several clinical syndromes in their various stages and the pathologic picture present in the spleen.

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Discussion of Splenectomy for Splenic Anemia in Childhood (H. Z. Giffin, Mayo Clinic).—An excellent conception of the varied types of disease in which anemia is associated with chronic enlargement of the spleen in children and infants can be obtained from the several papers by Wentworth, in which are given excellent reviews of reported cases. Wentworth concludes that the splenic anemia of infancy is a secondary anemia and in no way related to leukemia. He also infers that the adult form of splenic anemia may be a prototype of the splenic anemia of infants. Hutchison collected 22 cases of the splenic anemia of infancy in patients from 9 months to 2½ years of age. Ostrowsky reports 10 cases of his own, varying in age from 7 months to 2 years with leukocyte counts of from 8,000 to 25,000. Carpenter in a review of 348 patients with splenomegaly, under 12 years of age, places rickets first and syphilis second in the etiological role. Ashby concludes that the toxin causing rickets may also cause the splenic anemia of infancy and that the reported cases vary from those with marked bone changes and small spleen to those with slight bone changes and a very large spleen. Carr draws attention, however, to the following facts: First, that in a majority of rickety children there is no splenic enlargement; second, that there is no connection between the severity of the rickets and the size of the spleen or the degree of the anemia; third, that in certain cases of the splenic anemia of infancy there is no evidence, whatever, of rickets. The general experience seems to indicate that, granted the frequent association of rickets, there are yet certain cases which, on account of their marked splenomegaly and their severe anemia, their evidences of extensive blood destruction, and a reversion to the fetal type of hemopoiesis should, for the present at least, be grouped together as a separate disease entity.

Reports of cases of the adult form of splenic anemia occurring in children under 2 years of age are very difficult to find, while the splenic anemia of infancy seems practically never to be present in patients over the age of 2½ years. This observation is in itself suggestive of the possibility that some relationship may exist between the two diseases. The chief clinical distinctions between the adult form of splenic anemia and the splenic anemia of infancy are in the blood picture, and chiefly the characteristics of the leukocyte count. In the splenic anemia of infancy there is more evidence of blood destruction than in the splenic anemia of adults; the red cell count is likely to be lower and the color index consequently higher, and normoblasts and megaloblasts

are present in the blood smears. In the adult form of splenic anemia there is an absence of leukocytosis while in the splenic anemia of infancy there is a notable leukocytosis, which is, however, in reality a lymphocytosis. Our knowledge concerning the normal blood of infants and the reaction of the infant's blood to various toxic agents would lead us to regard these differences as less surprising. And especially does the biological fact that infancy is a transition period, in which there may be reversions to the fetal type of hemopoiesis, have a bearing upon the variations in the infantile type of splenic anemia. In addition to the above characteristics, we now have also the knowledge that splenectomy has been followed by excellent results in both conditions. These facts would suggest the possibility that the splenic anemia of infancy may be a similar condition to the splenic anemia of adults and that the differences may be largely due to the peculiar reaction of the infants' hemopoietic system to the etiologic factor in the disease. For the present, and until our knowledge is much fuller, a sharp distinction should be drawn between the two conditions.

SUMMARY

1. The normal lymphocytosis of the infants' blood and its decided reaction to various toxic agents is always to be taken into account in consideration of any case of infantile anemia. Infancy is a transition period during which a reversion to the fetal type of hemopoiesis is likely to occur.

2. The adult form of splenic anemia as it occurs in children and the splenic anemia of infancy have many characteristics in common, and also certain distinctive differences.

3. There is sufficient evidence to indicate a close relationship between the adult form of splenic anemia as it occurs in childhood and the splenic anemia of infancy. Until our knowledge is fuller, however, a sharp distinction should be drawn between the two diseases.

4. Splenectomy has been performed in only a few instances of the adult form of splenic anemia occurring in the first decade of life. One case of this character is reported herewith. There is a doubt as to the exact diagnosis in some of the seven cases collected from the literature.

5. A review of the literature of the splenic anemia of infancy (anemia pseudoleukemica of von Jaksch) shows that splenectomy has been performed in 4 instances of severe types of the disease, with marked immediate improvement.

The Diagnosis of Diseases Associated with Enlargement of the Spleen (H. Z. Giffin, Mayo Clinic).—Examination of the liver and spleen at the time of operation has stimulated the interest of the surgeon in diseases which have been hitherto regarded as entirely medical. This interest will result in additions to our knowledge of the relative functions of the organs of the upper abdomen and will eventually assist in making the classification of hepatic and splenic diseases more nearly definite. That one may be in the receptive mood it is necessary to become as familiar as is possible with the diagnosis of diseases associated with splenomegaly.

The exact degree of enlargement of the spleen is usually not determined until an edge is palpable below the costal margin. The fact that the outline of the spleen by percussion is uncertain because of its situation is not an excuse, however, for the more or less general carelessness exhibited in examining for the size of the spleen as a matter of routine. The spleen may lie high and be enlarged transversely, and in this event a definite splenomegaly may be overlooked. Perisplenitis is a frequent surgical and pathologic finding, and it is quite likely that clinical evidence of this condition is not obtained as often as it should be.

If a patient with a palpable enlargement in the region of the spleen presents himself for examination, it is of course first essential to determine positively whether or not the organ be spleen. And this distinction is not always easy. The question will usually lie between spleen and kidney. If one can feel edge and notch, there is no difficulty, but it is sometimes impossible to demonstrate the characteristic contour. The edge of the spleen, like the edge of the liver, may at times be revealed by pressing the mass forward and toward the median line at the same time everting the anterior portion. Similarly, the organ may be pressed into the loin and its edge everted. Often the kidney may be demonstrated as a separate mass lying posteriorly. By these means a difficult diagnosis may be made simple. At times, however, the only certain method of arriving at a conclusion is by means of cystoscopic and pyelographic examination. The development of pyelography assures reasonably accurate information as to the existence of a tumor of the kidney, and pyonephrosis, hypernephroma, and cystic kidney have so resembled the spleen as to make a diagnosis impossible without this procedure, and perfectly definite with it. The position of the kidney as demonstrated by the injection of colloidal silver may be compared with the position of the tumor at the time of exposure, taking into consideration the focus used in making the radiogram.

Movable and wandering spleens are occasionally seen and, upon superficial examination, may be diagnosed as movable kidney. The spleen may descend as low as the pelvis. If, however, the occurrence of wandering spleen be kept in mind, the organ usually can be recognized by its contour. Two cases of wandering spleen have been operated on at St. Mary's Hospital. Another patient had been operated on elsewhere for movable kidney apparently as the result of a mistaken diagnosis. The kidney had been stitched up, but the tumor, which, upon palpation, showed all the characteristics of spleen, remained as movable as before.

Upon first consideration it would appear that tumors of the stomach and intestine could not be confusing in the diagnosis of splenomegaly. During the last year, however, the writer has observed two cases in which a large carcinomatous mass could not be differentiated from enlargement of the spleen before operation. The absence of a history of gastric symptoms, negative findings on gastric analysis, the demonstration of an edge, and the location of the tumor led us to regard the tumor

as most likely spleen, although the contour was not typical enough to warrant a positive diagnosis. One of these cases had been diagnosed previously as splenic anemia by an internist of great experience. An intestinal tumor will more often simulate the kidney than the spleen. The left lobe of the liver may be enlarged in such a way that its edge descends at the left costal border and is thus confusing. Omental tumors must be differentiated from movable spleen. If the splenic dullness can be definitely outlined by percussion, a diagnosis may be made by exclusion.

The spleen may be moderately enlarged for years without apparent injury to health. Osler[1] reports having seen a group of such cases in women without anemia and from no evident cause. On several occasions we have observed in Greeks a moderate enlargement of the spleen without complaint or indicative findings. Some of these doubtless had had malaria. Cabot[2] has noted that other peoples from Southern Europe present the same condition.

While a slight enlargement of the spleen seems to occur without harm, it must also be remembered that splenic enlargement sometimes precedes the development of anemia by several years' splenic anemia, and the spleen must be looked upon as a possible source of future trouble, especially if it be of considerable size. Its removal may then be considered.

The spleen may be temporarily enlarged in many of the *acute infections of childhood*, also in *rickets* and other forms of *malnutrition* in babes. The enlargement of the spleen which occurs with *typhoid fever, generalized tuberculosis*, and *malaria*, need only be mentioned. In connection with tuberculosis it must not be forgotten that a marked tuberculous enlargement of the spleen may occur without evidence of tuberculosis elsewhere. In some of the reported spleens, however, the tuberculous process seems to be less prominent than the general hyperplasia. One patient of this type was operated upon at St. Mary's Hospital in 1904 and made a good recovery, but died four months later. Franke[3] has collected ten such operative cases. It is not likely that this type of splenomegaly will be differentiated from splenic anemia unless tuberculosis can be demonstrated elsewhere in the body. The spleen of malaria has been removed when other treatment has failed to prevent the return of attacks. The diagnosis is usually made easily; in fact, there is a temptation to ascribe splenic hypertrophy to malaria when it may have no etiologic relationship.

Syphilis of the spleen should always be considered as a possibility in every patient with splenomegaly, and a Wassermann reaction can not be neglected in any questionable case. The frequency of syphilis seems to be quite generally appreciated at the present time so that this error is less likely to occur today than it was ten years ago. Syphilitic cirrhosis of the liver with splenomegaly is of comparatively frequent occurrence, and the difficulty of obtaining a history of infection is notorious. Congenital syphilis of the spleen is not rare in children.

There is, however, a *nonluetic cirrhosis* of the liver, which occurs in children; ascites and moderate enlargement of the spleen are present.

Primary sarcoma of the spleen is rare; the growth of the organ is rapid. Twenty-five cases have been reported and are reviewed in a paper by Bush.[4] Eleven of the 25 were discovered at autopsy, while in 14 splenectomy was done with four operative deaths. Two remained well for several years. Pathologists agree that a positive diagnosis of sarcoma of the spleen is often hazardous, and when recurrence does not follow there is a possibility that the tumor was in reality a benign *lymphoma.* (Türk;[5] Sternberg.[6]) One patient on whom splenectomy was done at the Mayo Clinic for what was morphologically lymphosarcoma has remained well for seven years. In another case a diagnosis of lymphoma was made, and the patient has remained well for a year and one-half. Clinically these two cases presented the syndrome of splenic anemia.

The Gaucher type of endothelioma of the spleen is regarded by some observers as a true tumor. Clinically, however, these cases may not be differentiated from splenic anemia, although Brill[7] has suggested certain points which may be of assistance in diagnosis. Three spleens of this type have been removed at St. Mary's Hospital. The clinical histories were those of splenic anemia.

Cystic spleen may be difficult to differentiate from cystic kidney and cyst of the pancreas. Cyst of an aberrant duct of the liver in the left triangular ligament has been reported. Cysts occur in the spleen in about there per cent of patients with hydatid disease. Of nonparasitic cases, 42 instances have been reported (Musser[8]). *Fibroma* of the spleen is rare. *Carcinoma* of the spleen is secondary and uncommon in occurrence. *Infarcts* in arterial disease and *abscess* in infectious diseases may cause splenic enlargement.

Pernicious anemia may be associated with enlargement of the spleen, and, if the blood findings be not typical at the time of examination, a diagnosis may have to be deferred. The spleen is usually not large, and in this there is a contrast with splenic anemia and Banti's disease. Occasionally the coexistence of a very large spleen and an atypical blood-count leads to a questionable diagnosis.

Lymphatic and myelogenous leukemia need only be mentioned as the blood pictures are pathognomonic. Care, however, must be taken if leukemia be seen in the aleukemic stage. It must not be forgotten that an enlarged spleen accompanies *polycythemia.* The term *pseudoleukemia* is indefinite and should probably be reserved for that condition in which lymphocytic infiltration of the viscera occurs without the characteristic blood changes of lymphatic leukemia. There is a low leukocyte count with lymphocytic increase, enlargement of the liver and spleen, and slight enlargement of the lymphatic glands. The microscopic examination of an excised gland shows hyperplasia. This condition often occurs in children and may be in reality some one of the other forms of anemia in which the blood picture has been altered by reason of its attack upon

a youthful rather than an adult organism. The diagnosis of the diseases of the blood in children is very uncertain at best. Secondary anemias occurring with rickets, and congenital syphilis may give blood pictures suggestive of pernicious anemia, lymphatic leukemia, myelogenous leukemia, or splenic anemia.[9] Consequently, when an abnormal blood picture is obtained in an infant, the possibility of nutritional disturbances must first of all be considered.

Splenic anemia seems to be a fairly definite *clinical entity,* although many observers prefer to look upon it as a symptom complex. It is described as a disease of unknown origin, presenting a progressive enlargement of the spleen; a chronic course of from months to ten years and even twenty years; an anemia of the secondary type, generally with leukopenia; a tendency to hemorrhage, especially to hematemesis; a certain degree of pigmentation in the late stages; and a secondary cirrhosis of the liver with or without ascites. The histories of these cases seem to indicate that the splenic change is primary. Enlargement of the spleen may be present for years before the development of anemia. An absence of leukocytosis seems to be an almost constant finding. Leukocytosis, save after hematemesis, should, therefore, make one suspicious of some condition other than splenic anemia. The spleen is often very large, and in this it differs from the spleen of hepatic cirrhosis. In *cirrhosis* the liver-changes seem to precede the splenic enlargement, while the reverse is true in splenic anemia. In cirrhosis again the anemia is less marked, and an etiologic factor of cirrhosis may be present. *Hanot's cirrhosis,* presenting a moderately enlarged spleen, occurring in young people without a history of the usual causes of cirrhotic liver and accompanied by a chronic jaundice, should not be difficult of differentiation. In *hemochromatosis* the changes in the liver and the splenic enlargement are concomitant, and the deposition of iron pigment in the skin and viscera and, later, diabetes as a result of involvement of the pancreas, form a definite clinical picture. Splenic enlargement may also occur in *Hodgkin's disease.* In late Hodgkin's disease the splenic and hepatic hypertrophy may be prominent, while the size of the lymphatic glands may decrease and a leukopenia occur giving a clinical picture which at first sight may suggest splenic anemia.[10] The history of the early involvement of a group of glands, however, usually points the way to a diagnosis. The excision and microscopic examination of a gland will often give positive evidence. In the *family type of hemolytic jaundice* with splenomegaly the jaundice may be absent temporarily, and the condition may thus be confused with splenic anemia.[11] *Acute infectious epidemic jaundice* (Weil's disease) would give no difficulty because of its clinically acute infectious nature. As previously noted, syphilis of the spleen must always be kept in mind and carefully excluded.

There is a group of cases simulating the clinical picture of splenic anemia and, in addition, presenting findings suggestive of an acute or subacute infectious process. The fever may be remittent or intermittent

and accompanied by chills. Attacks may last two or three months at a time and may recur at intervals of several months, or the condition may be an acute one, giving a history of several months' illness. The size of the spleen and liver may be much reduced between attacks, and the patient may return to good general health. Leukopenia is present save at the time of chills and high fever. Blood cultures are negative, and no evidence of syphilis, malaria, or tuberculosis can be detected. Two cases with these characteristics have been observed by the writer. Are these acute types of splenic anemia, or is the clinical course the result of phlebitis of the splenic vein, a condition which has been reported in the autopsy findings in certain cases? The condition may indeed be due to a more or less generalized chronic infectious process. In view of the fact that *kala-azar* with its enormous enlargement of liver and spleen may make its appearance at any time, it is imperative in cases of the foregoing type to examine the peripheral blood, the blood obtained by splenic puncture, or an excised cervical gland, for the presence of Leischman-Donovan bodies.

In all, 27 splenectomies have been done at the Mayo Clinic, St. Mary's Hospital, from April, 1904, to July, 1912. Of these cases, 18 conformed most nearly to the group commonly regarded from a clinical standpoint as splenic anemia.

A review of the diseases associated with enlargement of the spleen impresses one with the fact that exhaustive examinations and complete notes are necessary if we may hope to arrive at a definite grouping of these obscure conditions. Pathologic and clinical information must be carefully correlated. Certain rare disorders must be kept freshly in mind. Laboratory findings must be utilized in the differentiation more liberally than is ordinarily necessary. One is repaid, however, by the unusual interest attaching to these diseases, especially to those that simulate the symptom complex of splenic anemia.

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The Relation of the Spleen to Certain Obscure Clinical Phenomena (William J. Mayo).*—*Pernicious Anemia.*—We have removed the spleen fifty times for pernicious anemia. In each case the diagnosis was well established, and the spleen, with four exceptions, was above normal in weight. In some instances the spleen was greatly enlarged, weighing up to 2330 grams.

*Wesley M. Carpenter Lecture, New York Academy of Medicine, New York City, Oct. 18, 1917.

There has been no definite relation between the size of the spleen and the seriousness of the disease, nor was there any direct relationship between the result of the splenectomy and the size of the spleen removed. This of itself is a suspicious circumstance. The benefit derived from splenectomy, generally speaking, has followed the removal of a definitely enlarged spleen. The failure to establish such relationship in pernicious anemia, or to connect with the disease such gross and microscopic changes as are to be found in the removed spleens, would lead us to expect only limited benefit rather than cure of pernicious anemia through splenectomy. There was temporary improvement in every case, but following splenectomy we had some cases in which the cord changes progressed in spite of a great improvement in the anemia. We have not had a patient who has been cured, but all in all, in about 75 per cent of the cases the benefit might be said to be sufficient to justify the operation. In the total number of operations three patients in our early experience died from the operation; the hemoglobin was under 30 per cent, the red cells were under a million. These patients should have been transfused before operation. Since practicing transfusion in advance of splenectomy, when the blood has been seriously deteriorated, we have had no deaths. There were no operative deaths in the last 32 cases. In many cases after initial improvement by transfusion and splenectomy, relapse has taken place, followed again by improvement after transfusion. We have carried some of these patients along for months in fair health by repeated transfusions; as many as thirty have been given to a single patient. Following each transfusion there would be marked benefit, with gradual depreciation, until transfusion again became necessary. It has been believed that the introduction of new blood stimulates the hematopoietic organs, and this is probably the true hypothesis in patients whose bone marrow is not too severely damaged. Yet it should be noted that immediately after the transfusion, in certain cases, the anemia is relieved, the hemoglobin brought up from 10 to 30 points, and the red cells advanced appreciably, only to be followed by a gradual decline. These are the predominately myelotoxic types. It is an interesting conjecture whether or not the patient may live on the work of transfused blood as well as be stimulated to the formation of new blood. A probable explanation is that the life of the red corpuscles is much longer than we have thought, and that the anemia returns in proportion as this fresh aid is used up. The significant blood changes in pernicious anemia that differentiate it from secondary anemias are the changes in the number and type of the red corpuscles and in the blast cells found in the blood. The blast cells are the mothers of the erythrocytes, and each blast cell thrown into the blood represents a permanent loss of blood-making power. Therefore, neither stimulation nor treatment can reproduce that which has been lost. The difficulty with the whole subject of pernicious anemia concerns the fact that we do not recognize the disease until such vital and permanent changes as are indicated in the actual loss of these blast cells have taken place. It is even possible that pernicious anemia, in its beginning, is not a definite entity, but that it is a terminal change of several conditions which we have not recognized until they have reached the

final stage. Clinically, however, it is a very definite disease when both history and blood picture are developed. Pernicious anemia may be called a cancer of the red cells, recognized in the hopeless stage. When the early histories of patients with pernicious anemia are studied the symptomatology seems fairly clear; yet many patients are seen with anemias which are suspected to be pernicious but which never develop the true characteristics of the disease. If pernicious anemia is to be cured it must be done before permanent damage to the hematopoietic organs has taken place. It is possible that certain types may be cured; yet so firmly fixed is our belief concerning the incurability of the disease that should we have patients cured by splenectomy we would be inclined to lift them out of the category of pernicious anemia and to group them with either hemolytic icterus or splenic anemia.

To sum up, splenectomy has a field of usefulness in selected cases of pernicious anemia, especially in those showing a marked hemolysis by the Schneider duodenal test and evidence of slight bone marrow damage. The operation of removal of the spleen for pernicious anemia is not, as a rule, difficult. The spleen is only of moderate size, and not very adherent.

Leukemia.—If there has been any one condition believed to be non-surgical and incurable, it is splenomyelogenous leukemia. The theory has been that 95 per cent at least of such patients operated on would die as a result of the operation, and that the 5 per cent who lived would not be benefited. Yet we have long known therapeutic agents (benzol, x-ray, etc.) which would reduce the size of the spleen and would also improve the condition of the blood; and as the size of the spleen became reduced such improvement might be expected. With the use of radium, which could be readily applied over the area of the spleen, a vast change came about in the therapeusis of splenomyelogenous leukemia. I do not know of any clinical experience that is more striking than the result which follows the application of radium over a huge leukemic spleen. Many times the spleen shrinks so greatly as to disappear below the left costal margin, the white blood corpuscles drop from hundreds of thousands to under 10,000. I have seen a leukopenia produced, the white cells dropping from 600,000 to 3,700 in five weeks. Accompanying this extraordinary reduction in the size of the spleen and reduction in the number of white cells an equally extraordinary improvement in the anemia takes place, and the patient is marvelously benefited. As the spleen gradually increases again in size the white cells increase, the red cells decrease, and the patient loses ground. It is well to eliminate all of our presumptions concerning this disease and pause for a moment in perspective. Reduce the size of the leukemic spleen, and synchronously the white cells go down, the red cells come up, and the patient improves. As the spleen enlarges, the whites come up, the reds come down, and the patient goes down. Have we in this, as in so many other instances, allowed tradition to hamper progress?

My first experience in splenectomy for myelogenous leukemia was with a patient who came to the clinic with a greatly enlarged spleen, a white count of between 200,000 and 300,000, and who gave a history of having

had the disease for two years. There had been very great improvement under x-ray therapy; at one time the white cells were reduced by it to a point under 50,000, but, as regularly happens, the x-ray had finally lost its effect, and her condition when examined was worse than it had been at any former time. The patient herself was greatly impressed with the definite connection between the size of the spleen and her condition, and was anxious to have it removed. I removed the organ, and the patient made an excellent surgical recovery. Within ten days the white cell count had dropped to less than 50,000 and the patient is greatly improved now, more than one year following the splenectomy.

Based on this experience, we have in a number of instances reduced the size of the spleen with radium until the blood count approximated the normal, and then removed the spleen. We have found it inadvisable to force an extreme reduction of the leucocytes before splenectomy. If the general condition of the patient is good, a leucocyte count of 30,000 or less is satisfactory. All the patients, save two, have been markedly relieved. In the 19 cases there were no operative deaths. That these patients are cured I cannot believe, but the experience has been interesting and suggestive.

Here again we find ourselves in difficulties not dissimilar to those in connection with the etiology and clinical course of pernicious anemia. One patient in our earlier experience, I remember well, had been treated for leukemia during a period of five months in a large and well-known hospital, and in another for three months. We diagnosed the condition as splenic anemia. The spleen was removed, the patient promptly recovered, and has remained well now for more than five years. It is possible that we recognize leukemia as a disease only after it has reached the hopeless stage, a terminal condition of a much more common though unrecognized malady. It is questionable whether all the cases of splenomyelogenous leukemia advance to the point where they are recognized as leukemia. These are interesting problems which can not now be answered. Leukemia may be called a cancer of the white blood, recognized in the hopeless stage. The leukemic spleen is not adherent, as a rule, and after reduction in size by radium is readily removed.

Hemolytic Icterus.—We have performed splenectomy 19 times for hemolytic icterus. The results have been astonishingly good. I do not know of an operation giving more gratifying results. The jaundice which the patient has had for perhaps years will be perceptibly less in forty-eight hours, and within four days will have quite disappeared. Sixty per cent of these patients have complicating gallstones, apparently due to the greatly thickened bile, the result of pigments derived from the disintegrated erythrocytes. There are two types of hemolytic icterus, the familial or congenital type of Minkowski and the acquired type of Hayem and Widal. In the familial type several members of the same family may be affected, and possibly it may be found through several generations. As a rule, it is less serious than the acquired variety. Although never robust, many times those affected with familial hemolytic icterus will live out a normal life expectancy. The

acquired type is much more serious, and ends, as a rule, in death from some intercurrent malady after years of chronic semi-invalidism.

The outstanding features of hemolytic icterus are the enlarged spleen, more or less enlarged liver, and chronic recurring jaundice, without gross obstruction in the bile ducts. Bile is always to be found in the stool. Inasmuch as a high percentage of these patients have complicating gallstones, they may have an increase of jaundice due to a secondary infection from gallstones, varying the syndrome and introducing diagnostic difficulties. These patients all show marked anemia, and usually crises more or less serious develop in which there is pain over the region of the liver and spleen, with malaise, some increase of temperature, and an increase of jaundice. Chauffard and Widal have pointed out the diagnostic phenomena of increased fragility of the erythrocyte, which is practically constant. Splenectomy, as a rule, is not difficult in these cases, for although the spleen may be quite large it is seldom adherent to a marked degree. There was but one operative death in our series. This patient was operated on during a crisis, and death probably would not have occurred had the operation been performed in the interval between crises.

Biliary Cirrhosis.—Hemolytic jaundice is often confused with certain types of non-infective biliary cirrhosis, and especially with the so-called Hanot's cirrhosis. We have removed the spleen four times for biliary cirrhosis, which could not be properly classified as hemolytic jaundice. All the patients were above 30 years of age. Were it not for the age, the cases could be called Hanot's cirrhosis. The results in three were very satisfactory. The jaundice disappeared to a large extent, and the patients were able to return to work; but in all the liver remained large. The operation of splenectomy for biliary cirrhosis is somewhat troublesome and difficult, more so than in hemolytic icterus. In our cases the spleen was large and there were many adhesions. In two the liver was sufficiently large to interfere mechanically with the operation.

Splenic Anemia.—Osler was one of the first to describe splenic anemia, and his classical contributions, coming as they did at an early time, created a great and lasting interest in the condition. Splenic anemia is at least a clinical entity, but has been confused with many varieties of splenomegalias, syphilitic, septic, malarial, hemolytic, jaundice, pernicious anemia, etc. Little by little an irreducible minimum is being reached and a definite type established. The patients having large spleens develop a progressive anemia and cirrhosis of the liver as a terminal condition to which Banti's name has been given.

The course of splenic anemia is chronic. There may be intervals of years in which the patient enjoys a fair degree of health, but eventually it leads to a fatal issue, the debilitated patients succumbing to intercurrent disease.

Hemorrhages from the stomach are of frequent occurrence in splenic anemia and sometimes hemorrhage is the first symptom that may be noted. The hemorrhages are probably gastrotoxic in origin and while, as a rule, fatal hemorrhage does not result, frequent, recurring hemorrhages cause great debility. The gastric hemorrhage of splenic anemia is a symptom well

worthy of attention. It is not different from that which occurs in connection with hepatic cirrhosis and it is altogether probable that many of the unexplained hemorrhages from the stomach in which no local lesion of the gastric mucosa is to be found, are a result of the toxic condition which precedes, accompanies, or is caused by splenic anemia and cirrhosis of the liver. Balfour, in a paper on the causes of gastric hemorrhage, calls special attention to the relationship of the spleen and liver to the bleeding. In gastric hemorrhage we must think of the spleen and the liver as causative factors just as in the differentiation of the causes of jaundice the spleen must be thought of as well as the liver. Warthin and others have found that many cases of splenic anemia show thrombosis of the splenic vein after death and they believe that the thrombosis is the cause of the splenic condition. In one of our patients who died the cause of death was found to be due to long-standing splenic and portal thrombosis. The final catastrophe was brought about by thrombosis of the superior mesenteric vein. It may be contended that splenomegaly associated with splenic, portal, or mesenteric thrombosis (one or all) would be better grouped with infectious splenomegaly (probably streptococcal) rather than with true splenic anemia.

The pseudoleukemia of infants described by von Jaksch is closely associated, if not identical with splenic anemia, but because of the hematopoietic variability of infancy is often accompanied by a high white cell count. Such cases are usually to be relieved by dietetic management, but the spleen has been removed with prompt and striking improvement. Balfour splenectomized a two and a half year old child presenting the complete picture of splenic anemia.

Splenic anemia is cured by splenectomy in a high percentage of cases and it should be performed before portal cirrhosis or thrombosis of the splenic vein occurs. The spleen is usually large and, as a rule, extremely adherent and the operation is more difficult and dangerous than in any of the various other diseases for which splenectomy is indicated. In 43 splenectomies for splenic anemia we have lost 4 patients.

Clinically, patients with enlargements of the spleen are to be seen in whom the enlargement is apparently not producing symptoms, but these cases should be looked on as incipient splenic anemia. Such causeless splenomegalias as I have had opportunity to observe have eventually led to marked secondary anemia, although perhaps for years showing little effect on the patient's health. I have seen no good and much harm come from chronic splenomegalia, and other things being equal, such spleens should be removed on general principles.

Portal Cirrhosis.—The portal cirrhosis of the liver which so frequently accompanies the later stages of splenic anemia have led us to remove the spleen in 5 cases of primary portal cirrhosis in which there was enlargement of the spleen. The results on the whole have been gratifying, although one patient died following the operation. The remaining four are in satisfactory condition. For those portal cirrhoses with enlarged spleen which occur especially in young adults without alcoholic history, splenectomy would appear to be indicated. As a matter of fact in cases of this descrip-

tion do we not classify as primary portal cirrhosis those in which the liver condition is discovered first? If the splenic enlargement is first observed we call it splenic anemia with portal cirrhosis.

The technique of splenectomy I will not dwell on. For those who are interested, I would refer to the article by Balfour, "The Technique of Splenectomy."

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Splenectomy

Balfour developed the present splenectomy technic of the Mayo Clinic which consists briefly of leaving the spleen *in situ* to hold back the abdominal organs while it is being shelled out by the fingers, packing carefully behind until freed and brought out of the abdomen. When adherent it is found that after ten or fifteen minutes the gauze packing will have controlled the oozing completely. The stomach is then carefully freed, the tail of the pancreas avoided, and the vessels become readily manageable by clamps.

The following is reprinted here from an article that appeared in Annals of Surgery, August, 1915:

Surgical Considerations of Splenectomy (William J. Mayo).—*Splenectomy.**—The safety of splenectomy depends on careful separation of the attachments of the spleen and its delivery without injury to the vascular pedicle. Therefore much depends on the size and movability of the spleen and the amount and vascularity of its adhesions as well as on the thickness of the abdominal wall.

Incision.—Bevan[1] in 1897 described a most satisfactory incision for operations on the gall bladder and biliary passages which has been modified by various surgeons. A longitudinal incision is made through the upper rectus muscle extending obliquely along the costal margin, about an inch and a half from it and up toward the ensiform cartilage. The longitudinal part of the incision may be carried down to any desired length permitting careful abdominal exploration. In this respect its value in operations on the biliary tract is very marked, as an appendix may be removed or any necessary operation may be performed on the pyloric end of the stomach or duodenum. The incision made on the left side is equally advantageous in gaining access to the spleen. In working in the biliary region the longitudinal part of the incision is best made in the inner half of the rectus muscle, for splenectomy it is best made in the outer half. If the incision across the rectus muscle is kept an inch or more from the costal margin, this little flap, when caught with a catspaw, makes an excellent retractor.

Adhesions.—In most cases in which splenectomy is necessary, the spleen is enlarged and adherent to the parietal peritoneum and diaphragm especially over the upper pole. These adhesions differ greatly in their vascularity, being occasionally purely vascular, composed of a small artery and one or more varicose veins. Since these vessels cannot be seen and controlled until the spleen is loosened from its bed and drawn

*The Collected Papers, Mayo Clinic, 1916.

down, it is usually best to separate them with the fingers as close to the spleen as possible, trusting the control of any hemorrhage to a large gauze pack until the spleen can be delivered and removed (Fig. 68).

Fig. 68.—The Bevan incision for splenectomy, shown in upper figure. Lower figure—method of using gauze pack for temporary hemostasis to control bleeding of separated adhesions. (Courtesy of Dr. William J. Mayo.)

At times the spleen is firmly fixed in position by adhesions so strong they must be divided by a cutting instrument. By making an opening

in the adhesions close to the splenic capsule and loosening the spleen as far as possible by a combination of enucleation and division, a very adherent spleen may safely be removed.

A subscapular splenectomy, in the sense one speaks of a subscapular nephrectomy, is not possible. The capsule of the spleen is closely associated with the splenic pulp which is lacerated in the attempt to remove it from within the capsule, causing great loss of blood. With a little care, however, the spleen can be separated immediately at the capsule, leaving the attachments in a condition so there will be comparatively little bleeding. In this way the spleen can be quickly delivered and the pedicle temporarily controlled by fingers or an elastic rubber-covered pedicle clamp. The main thing to be accomplished is to leave the separated attachments in such condition that a gauze tampon will temporarily prevent bleeding. In two cases in my earlier experience the spleen was so firmly fixed with vascular adhesions, I did not deem it wise to undertake splenectomy.

Separation of the Splenic Ligaments.—Much may be learned concerning the normal relations of the spleen by operative work on the cadaver. The most serious vascular attachments are the vasa brevia in the gastrosplenic ligament which pass to the stomach. However, the bulk of these attachments can be delivered with the spleen, since the stomach can be drawn from the abdomen to a very considerable extent before separating the gastrosplenic ligament. Unfortunately, in a large adherent spleen there may be vascular connections in the deeper portion of the gastrosplenic ligament which pass inward and backward to anastomose with vessels along the spine and the crux of the diaphragm. Since these must be separated before the spleen can be eviscerated, early careful adjustment of an adequate gauze tampon, for temporary control of hemorrhage, may be essential. The lienorenal ligament has no great vascularity and can be readily divided. After the delivery of the spleen, the remainder of the gastrosplenic ligament and a leash of vessels passing to the inferior border of the spleen which connect it with the splenic flexure of the colon are tied in sections. This completes the peritoneal and omental attachments about the hilum, and, by dividing a few adhesions here and there, the spleen can be lifted up so that the vascular pedicle lies completely exposed for at least two inches.

Pancreas.—The splenic pedicle should be searched for the tail of the pancreas which, if present, will lie in the pancreatic notch of the spleen, behind the hilum. It can usually be readily separated, a few ligatures applied to bleeding points, and then dropped back into the abdomen. In three splenectomies, I[2] tied off a portion of the tail of the pancreas with the splenic pedicle, in one case removing as much as an inch and a half, without any harm resulting. The spleen was bleeding so freely from lacerations that time could not be spared for separation. In the third case, in which the splenic vessels were atheromatous and would not hold a ligature, I tied the splenic vessels together with the body of the pancreas about three and one-half inches from its tip with two

ligatures of catgut, three-fourths of an inch apart. The patient recovered without serious symptoms.

The pancreas has five independent sources of blood supply which protect its circulation. The pancreatic ducts have been shown clinically and experimentally to have great powers of regeneration. Fat necrosis as the result of escaping pancreatic secretion from injury to the pancreas in this situation, apparently is not to be greatly feared, probably because its secretions are not activated by duodenal secretion.

Vascular Pedicle.—In the average case, the vascular pedicle can be so thoroughly cleared that it may be easily ligated in sections. The artery should be tied first, but all vessels should be tied before any portion of the pedicle is cut. In spite of this precaution the spleen sometimes tears from the pedicle before it can be ligated. This accident happened in one of my cases—a fleshy patient. The spleen had a short pedicle which retracted deeply, but I was able to grasp the vessels in my fingers and hold them until forceps could be applied. In this type of case it is better to grasp the entire pedicle with elastic rubber-covered clamps[3] which will temporarily compress without damage any attached viscus, such as the wall of the stomach, until the splenic vessels can safely be controlled. In two instances I have injured the stomach because of its close attachment to the splenic pedicle, in one case ligating a portion of the wall of the stomach in the pedicle. Fortunately there was no escape of gastric contents and I was able to repair the damage. The patient recovered. In the second case I was less fortunate. There were large varicose veins in the gastrosplenic ligament and, in making a thorough exposure of the pedicle, one of the veins in the wall of the stomach was torn. Unfortunately, tooth-forceps were used to grasp the vessel and the fragile gastric wall was lacerated. There was an escape of gastric contents into the bed from which the spleen had been enucleated and the patient died a few days later from sepsis.

When the vascular pedicle has been carefully exposed but is too short for accurate ligation of the vessels, the two-forceps method will be found very satisfactory. In this procedure, two forceps are placed three fourths of an inch apart on the pedicle and the spleen cut away without regard to back bleeding. A catgut ligature is thrown around the pedicle, below the proximal forceps, which is then loosened and the ligature tied in the compressed area, while the distal pair of forceps steadies the pedicle and prevents retraction. A second ligature makes the pedicle secure.

There are undoubtedly some cases in which splenectomy is indicated but in which the condition of the patient or the attachments of the spleen make the operation inadvisable.

Two years ago I[3] suggested the possibility of ligating part of the vessels, believing that it would have an effect comparable to the ligation of the thyroid vessels in hyperthyroidism. I have not had an opportunity to carry out this suggestion and am not at all sure that it could

be done with any degree of accuracy unless the delivery of the spleen were accomplished and in that event splenectomy would be equally easy and more effectual.

John Gerster[4] has suggested ligation of the splenic artery at the celiac axis as a preliminary step in splenectomy, or in some cases as a method of producing atrophy of the spleen when it would not be practicable to remove it. He has mentioned the ease with which the celiac axis can be reached through the gastrohepatic omentum. The splenic artery certainly could be conveniently tied at the celiac axis, or just where it lies at the superior border of the pancreas.

Experimental ligation of the splenic artery demonstrates that the normal spleen will not become necrotic, but that it will undergo atrophy. The blood supply from the splenic artery to the pancreas and stomach which would be cut off by ligation is not important and would be well taken care of from the numerous anastomotic branches of other sources.

Closure of the Splenic Space.—This procedure is exceedingly important. Compression with the large temporary tampon will enable the smaller vessels to become sealed in a few minutes, but in the deeper recesses of the wound, there will probably be vessels requiring other treatment. With catgut on a small curved needle, the raw space, beginning at the tied splenic vessels, is closed as well as possible. The margin of the lienorenal ligament, on the outer side, is sufficiently firm to hold a suture, but on the inner side such bits of tissue must be caught here and there. as can be done safely until the bleeding vessels are compressed. The last sutures come well down on the diaphragm and had best be applied during cardiac diastole and during expiration. In some cases the splenic space will be dry when the tampon is removed and suturing is not necessary. To be able to leave the wound dry is a great satisfaction and well worth the little extra time taken to accomplish it. One of my patients died of so-called secondary shock, due to failure to control hemorrhage at a deep point, and in two of my earlier cases, before I understood the value of the snaking catgut suture, I was compelled to leave a large tampon to control the oozing (Fig. 69).

Drainage is not needed unless there has been injury to some viscus. The after care is quite the same as that following any abdominal operation.

Mortality of Splenectomy.—The mortality of splenectomy depends more on the type of case accepted for operation than on the technical difficulty of the operation itself. If the patient is in good general condition, a small, movable spleen can be removed with a death rate so low as to be almost accidental. If the spleen is enlarged but has considerable latitude of motion, splenectomy may be performed with almost no mortality beyond the possible accidents of a serious operation. But if the spleen is enlarged and adherent and the patient is suffering from a high grade of anemia with myocardial and renal changes, marked by edema of the lower extremities, or is suffering

from ascites, jaundice, high temperature, etc., the mortality will necessarily be high. Even under these conditions, surprisingly few patients die directly as the result of the operation. In 14 of our patients

Fig.69.—Closure of splenic space by snaking catgut suture, to control oozing of blood from deep-seated areas. (Courtesy of Dr. William J. Mayo.)

edema of the lower extremities was marked. Seventeen had ascites with coincident myocardial and renal changes, 7 were jaundiced, and 5 were suffering from high temperature at the time of the operation.

There were many combinations of these conditions, all in connection with high grades of anemia, yet there were but 5 deaths in the hospital from all causes, in the 58 cases operated on. As shown by the post-mortem, 2 of the 5 deaths were from preventable causes (hemorrhage and sepsis). In conclusion, I desire to express my early indebtedness to J. Collins Warren[5] for his splendid paper, "Surgery of the Spleen," stimulating interest in the subject.

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GENERAL INDEX

A

Abscess of the spleen, 36
Abscess, tropical, 238
Actinomycosis, 240
Adenoids and tonsils, 241
Ainhum, 150, 235
Alcoholism, 206
Aleppo boil, 144
Amebiasis, 37
Amebic dermatitis, 149
Amebic ulcers, rectum, 91
Anakhre, 152
Anesthetics, 23
Appendicitis, 213, 229
Appendicostomy, 213
Arthritides, 158

B

Bacillary dysentery, 66
Balantidial dysentery, 63
Banti's disease, 26
Bess el Temeur, 144
Betel chewers' cancer, 28
Bilharzia hematobia, 111
Biskra button, 144
Blastomycosis, gluteal region, 91
Blood pressure, 23
Bronchomoniliasis, 30
Bronchomycosis, 30
Buboes, 154

C

Calabar swellings, 114
Calculi, urinary, 235
Cancer, 222
Cancer, neck and mouth, 28
Carcinoma, 222
Catastrophe surgery, 92
Cerebrospinal meningitis, 203
Chiggers, 150
Children, infectious diseases in, 242
China, observations on, 161
Chinese medicine, 165
Chronic ulcerations, 130
Chylocele, 104
Chylothorax, 104
Chylous ascites, 104
Cleft palate, 25
Climate, influence, 193
Clinical organizations, 22
Colon, diseases of, 37
Commonest surgical diseases, 193
Congenital anomalies of head, 25
Congenital defects, 238
Cosmopolitan diseases, 21

D

Delhi sore, 144
Dermal leishmaniosis, 144
Dermatomycosis, tropical, 145
Diabetes, 236
Diseases of the skin, 245
Diseases of women, 224
Distomum Hematobium, 111
Dracontiasis, 113
Dracunculus medinensis, 113
Drug habits, 206
Dysentery, bacillary, 213
Dysentery, entamebic, 37

E

Echinococcus, 240
Elephantiasis, 99, 244
Elephantiasis nervorum, 102
Emergency surgery, 92
Entamebic dysentery, 37
Epidemics of former times, 18
Europeans, habits, diseases, etc., 195
Ewundu, 151

F

Fibromata, symmetrical, 180, 181
Filaria Loa, 114
Filaria, prevalence of, 95
Filariasis, 95, 234
Filariasis, cysts, 98
Fistula in ano, 239
  tropical, 90
Fly bite, 144
Foot diseases and lesions, 249
Frambesia (yaws), 125
Fuente, 182
Furunculosis, 248

G

Game, 94
Gangosa, 116, 250
Gastric symptoms, 230
Genitourinary diseases, 90
Genitourinary diseases in men, 227
Glanders, 240
Goiter, 27
Gondou, 152, 235
Guinea worm, 113
Gynecology and diseases of women, 224
Gynecology and obstetrics, 86

H

Harelip, 25
Head, diseases of, 25
Heat prostration, 94
Hematochyluria, 111
Hemorrhage from the liver, 72
Hemorrhage in typhoid fever, 68
Hemorrhoids, 239
Hepatic abscess, 69
Hernia, 33, 237
Hodgkin's disease, 26, 236
Hookworm belt, 19

I

Infantile paralysis, 237
Infections, cause of disease, 18
  pyogenic, 155
Insect borne diseases, 18, 19
Intertrigo saccharomycetica, 147
Intestinal parasites, 216
Intestinal parasitism, 67
Intestinal worms, 216

J

Japan, observations on, 172
Japan, surgery in, 173
Jelly fish poisoning, 93

K

Kala-azar, 34, 144, 210

L

Laboratory methods in diagnosis, 23
Leeches, 94
Leishmania donovani, 144
Leontiasis, 153, 232
Leprosy, 134, 231
  surgery of, 140
Liver abscess, 69, 219
Liver, entamebic abscess, 69
Ludwig's angina, 25, 244
"Lumi-lumi," 200
Lymph varicose glands, 110
Lymph varix, 110
Lymphatic cysts, 27

M

Madura foot, 149, 240
Malaria, 203, 204, 205
Multiplicity of diseases, 23
Mutilations, military, 25
Mycetoma, 149

N

Native and home diseases, 252
Native treatment of wounds, 199
Neck, diseases of, 25
Neurofibromatosis, 102
Nodules, juxta-articular, 99

O

Obstetrics and gynecology, 86
Obstetrics, native, 225
Operating room technic, 22
Operation for liver abscess, 72
Oriental sore, 144
Osteomyelitis, typhoid, 212

P

Paralysis agitans, 237
Parasitism, intestinal, 67
Parotitis typhoid, 212
Pemphigus contagiosum, 249
Philippines, medical surveys, 178
  observations on, 174
Plague of fiery serpents, 113
Plagues of Middle Ages, 18
"Prickly heat," 247
Pulse, 23
Pyogenic infections, 155

Q

Questionnaire, answers to, 183
  races, physical conditions, food and habits, 184

R

Recklinghausen's disease, 25
Rectum, ulcers, amebic, 91
Resistance to surgery, shock and infection. Aseptic results, 190
Rickets, 25

S

Sand flea, 151
Sarcoma, 222
Sarcopsylla penetrans, 151
Skin, diseases of, 144
Skin diseases, 245
Skin granulomas, 233
Snakes and snake bites, 93
Spirillum fever, 203
Spleen, 257 (*see* Appendix)
  abscess of, 36
  diseases of, 34 (*see* Appendix)
Splenic anemia, 34 (*see* Appendix)
Sunlight, cause of disease, 17
Surgical material, 23
Surgical tuberculosis, 208
Syphilis, 130, 211
  fourth stage of, 116

T

Tartar emetic in kala-azar, 35
Temperature, 23
Tetanus, 155
Tetanus neonatorum, 200
Thorax, diseases of, 25
Tinea capitis, 147
  cruris, 146
  flava, 147
  imbricata, 147
  nigra, 147
Tonsils and adenoids, 241
Trichomycosis flava, et nigra, 148
Trichophyton skin infections, 247
Tropical abscess, 238
Tropical dermatomycosis, 145, 245
Tropical diseases in white races, 17
Tropical liver, 40, 219
Tropical ulcer, 233
Tuberculous nodes, neck, 26
Tuberculosis, surgical, 143, 208
Typhoid complications, 212

U

Ulcers, tropical, 233
Ulcers, rectum, amebic, 91
Urinary calculi, 235

V

Value of medical research, 20
Varicose veins, 239
Volcanic burns, 92

W

Women's diseases, 222
Worm of Pharaoh, 113
Wounds, infections, treatment, 198

Y

Yaws, 116, 232
  Castellani's treatment of, 129

INDEX OF GEOGRAPHICAL REGIONS

A

AFRICA, 36, 111, 150, 152, 205, 209
AGRA, INDIA, 186, 190, 193, 196, 198, 208
ASIA, 34

B

BARBADOS, 137
BASUTOLAND, 135
BURMA, 190, 193, 195, 198, 199, 203, 206, 208, 210

C

CANAL ZONE, 144
CAPE TOWN, S. A., 141
CAROLINE ISLANDS, 116
CEYLON, 30, 31, 91, 128, 188, 193, 196, 198, 199, 203, 207, 209
CHANGSHA, CHINA, 133
CHINA, 36, 131, 144, 161, 203, 205, 209, 210
COLOMBO, CEYLON, 188, 191, 205
CORFU, 129, 130

E

EGYPT, 91, 111

F

FORMOSA, 90, 188, 192, 193, 194, 197, 199, 203, 206, 207, 209

G

GUAM, 116, 124, 131, 186, 192, 197, 200, 204, 206, 210
GUINEA, FRENCH, 98

H

HAWAII, 134
HONDURAS, 155
HONGKONG, 191, 193, 196, 203, 207
HWAIYUAN, ANHWEI, CHINA, 34

I

INDIA, 104, 144, 150, 186, 190, 193, 196, 198, 203, 205, 206, 208
IVORY COAST, 154

J

JAPAN, 172
JOHANNESBURG, AFRICA, 232, 233, 234, 235

K

KOREA, 189, 193, 194, 197, 200, 206, 207, 209

L

LIBERIA, 98

M

MACEDONIA, 130
MADAGASCAR, 99
MALAY STATES, 30
MANILA, 195, 212, 234, 235, 242 245, 249
MARIANAS, 116
MARSHALL ISLANDS, 116
MOLOKAI, HAWAII, 141

N

NYASALAND, 99

P

PERSIA, 36
PING YIN, 191, 193, 198, 199
PORTUGUESE EAST AFRICA, 187

R

RANGOON, 212

S

SAMOA, 131, 186, 192, 194, 199, 203, 206, 208, 209
SOOCHOW, 191, 196
SOUTH AFRICA, 187, 191, 203, 241
SOUTH AMERICA, 152
SOUTHERN INDIA, 30
SWEDEN, 63

T

TARSUS, 116
TOMA, 98
TURKESTAN, 112

W

WEST AFRICA, 114, 150, 188, 191, 207, 241
WINCHOW, 191, 193, 198

Z

ZAMBOANGA, P. I. 187-191

INDEX OF AUTHORS

A

ADELUNG, 111
ALLBUTT AND ROLLESTON, 67
ANDREWS, 33
ASPLAND, 210
AVISON, 188, 255

B

BAETJER, 57
BANKS, 179
BARBER, 256
BARLOW, 155
BARRY, 256
BEAN, 179
BLAKE, SIR HENRY, 18
BOTREAU-ROUSSEL, 154
BOWMAN, 63
BRUMPT, 150
BUNTING AND YATES, 26

C

CADBURY, 165
CARNOCHAN, 103
CARONIA, 35
CARROLL, 19
CASTELLANI, 30, 91, 99, 101, 128, 145 155
CASTOR, 256
CHALMERS, 155
CHAMBERLAIN, 256
CHARLES, SIR HAVELOCK, 101, 104
CLAPIER, 98
CLARK, 231
CLEGG, 37, 136, 149, 178
COCHRAN, 34
COTTLE, 184, 255
CRAIG, 37
CREIGHTON, 152
CURREL, 188, 207, 255

D

DARLING, 37, 144
DELAMBOTTE, 107
DESILVA, 256
DI CHRISTINA AND CARONIA, 35
DIO CHRYSOSTOM, 116
DÖBBERTIN, 106
DRUMMOND, 105

E

ECK, 105
EGGERS, 131
ELKINS, 112
EMILY, 114, 115
EMRICH, 61

F

FAUL, 255
FERGUSON, 33
FESCHENKO, 113
FOLWELL, 188, 255

G

GACHET, 36
GARRISON, 116, 124, 178
GESSNER, 104
GIFFIN, (*see* Appendix)
GOODHUE, 141, 142
GORGAS, 20

H

HALL, 188, 255
HANDLEY, 100, 103, 105, 107
HANSEN, 136
HARSTON, 256
HEISER, 140
HENSCHEN, 106
HIRST, 188, 255, 243
HOLLENBECK, 188, 255

J

JEANSELME, 147
JOHNSON, 188, 255

K

KARTULIS, 91
KENG, 149
KERR, 116, 123
KOCH, 19
KONDELEON, 103, 105
KURIEN, 128
KUZNETZOFF, 103

L

LANDSBOROUGH, 255
LANZ, 103

LARTIGAU, 68
LAVERAN, 204
LAZEAR, 19
LEIPER, 113
LEISHMAN-DONOVAN, 34
LENOURMANT, 103
LYNN, 90

M

MACKIE, 35
MACLAUD, 153
MANSON, 19, 95, 113, 153
MATAS, 103, 104
MAXWELL, 90
MAYO, 34, 105, 257
MCDILL, 74, 96, 97, 107, 157
MCDILL and WHERRY, 157
MILLER, 188, 255
MILLS, 189, 255
MORRISON, 105
MORROW, 135
MOSES, 134
MUSGRAVE, 37, 149

N

NARATH, 105
NICHOLS, 95, 234, 256
NORTON, 188, 255

O

OCHSNER, 24, 256
ODELL, 116, 124, 186, 255
OII, 241
OPPEL, 103
OSLER, 37

P

PAGE, 255
PHALEN, 95, 234, 256
PHILIPPINE JOURNAL OF SCIENCE, 182
PHILLIPS, 256
PLUMMER, 256
PURVIANCE, 188, 255

R

REED, 19, 133
REID, 188, 255
ROBERTSON, 112
ROGERS, 19, 36, 59
ROSANOW, 103
ROSE, 19
ROSENBAUM, 116
ROSS, 188, 255
ROSS, SIR RONALD, 19, 144, 204, 256
ROSSITER, 254
ROST, 231

S

SABOURAUD, 99, 146
SANDES, 141, 142
SCHIASSI, 105
SELLARDS, 37, 57
SENN, 116
SHAKESPEARE, 19
SHIGA, 67
SMITH, 255
SNELL, 255
STITT, 93
STRYKER, 202, 188

T

TALMA, 105
TURNER, 187, 256

U

UROLOGICAL CONGRESS OF 1912, GERMAN, 112
UNNA, 99

V

VAN BUSKIRK, 188, 255
VAUGHAN, 18
VEDDER, 37, 59, 256

W

WALKER, 19, 37, 64, 65
WEIR, 188, 222, 241, 255
WELLMAN, 111, 150
WELLS, 188, 255
WHERRY, 96, 111
WHERRY and MCDILL, 157
WYNTER, 105

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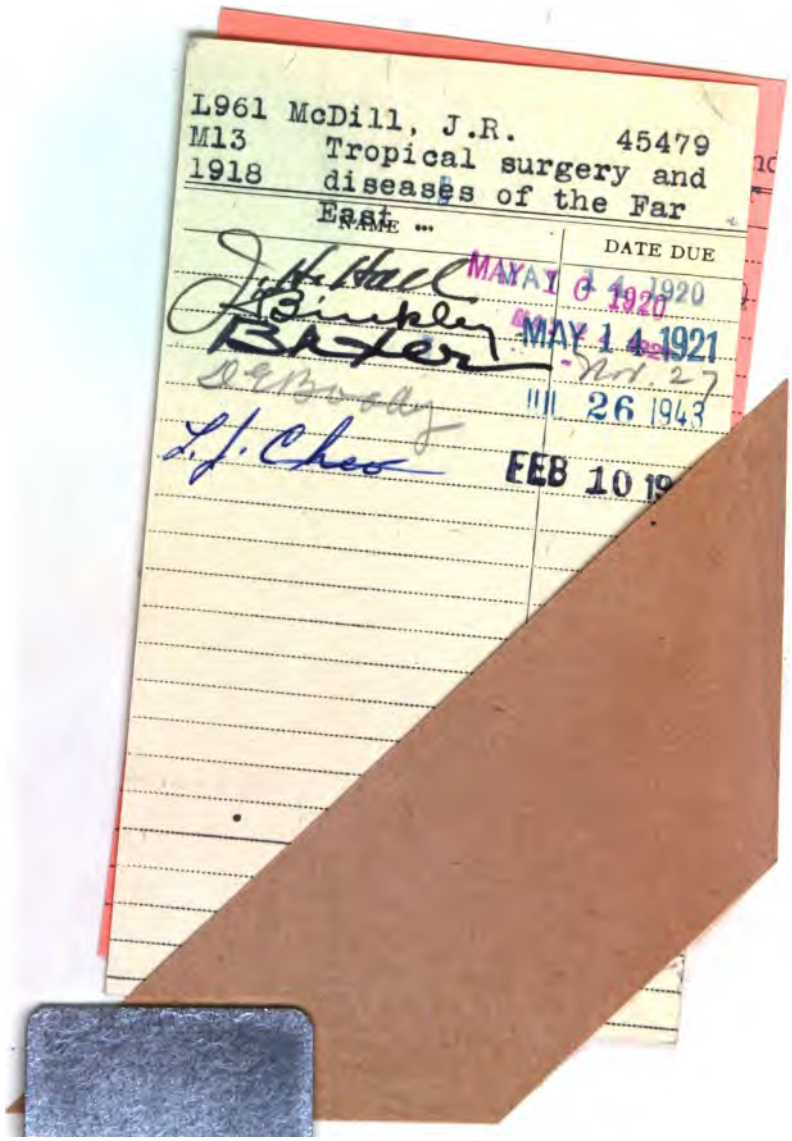

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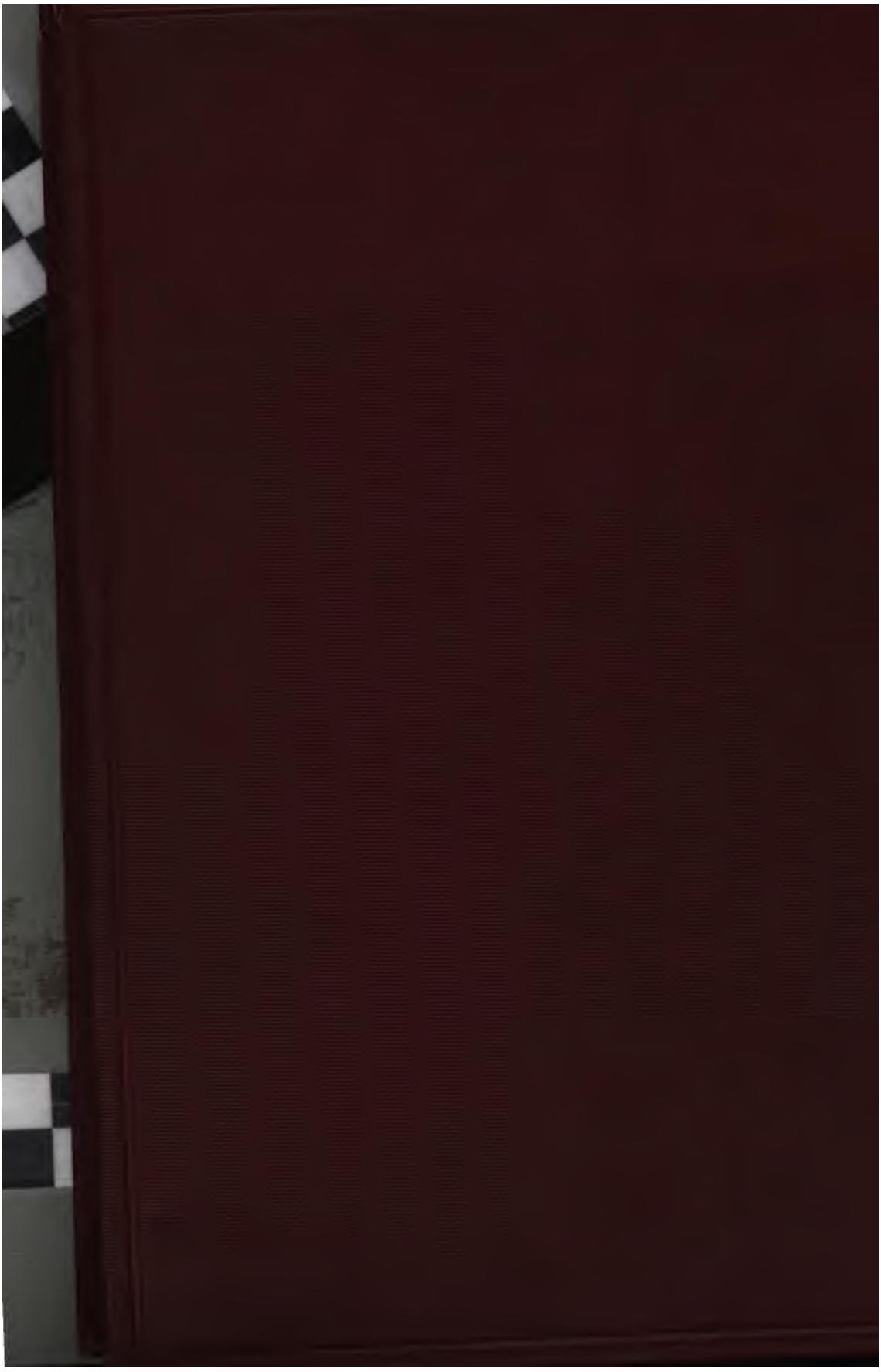
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